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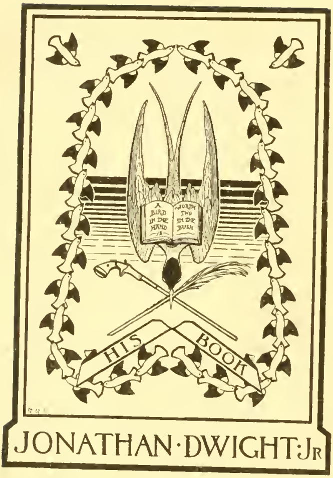
A BIRD IN THE HAND IS
WORTH TWO IN THE BUSH
HIS BOOK
JONATHAN·DWIGHT·JR

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SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM

PROCEEDINGS

OF THE

UNITED STATES NATIONAL MUSEUM

VOLUME 58

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1921

ADVERTISEMENT.

The scientific publications of the National Museum consist of two series—Proceedings and Bulletins.

The Proceedings, the first volume of which was issued in 1878, are intended primarily as a medium for the publication of original papers based on the collections of the National Museum, setting forth newly acquired facts in biology, anthropology, and geology derived therefrom, or containing descriptions of new forms and revisions of limited groups. A volume is issued annually or oftener for distribution to libraries and scientific establishments, and, in view of the importance of the more prominent disseminations of new facts, a limited edition of each paper is printed in pamphlet form in advance. The dates at which these separate papers are published are recorded in the table of contents of the volume.

The present volume is the fifty-eighth of this series.

The Bulletin, publication of which was begun in 1875, is a series of more elaborate papers, issued separately, and, like the Proceedings, based chiefly on the collections of the National Museum.

A quarto form of the Bulletin, known as the "Special Bulletin," has been adopted in a few instances in which a larger page was deemed indispensable.

Since 1902 the volumes of the series known as "Contributions from the National Herbarium," and containing papers relating to the botanical collections of the Museum, have been published as Bulletins.

William deC. Ravenel,
Administrative Assistant to the Secretary,
in Charge of the United States National Museum.

September 6, 1921.

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NOTES ON A COLLECTION OF SHELLS FROM TRINIDAD, CALIFORNIA.

By Eric Knight Jordan,
of Stanford University, California.

Trinidad Head, a lava promontory, lies about 28 miles north of the city of Eureka, California. It projects into the sea in a southwesterly direction, sheltering an area full of small volcanic knobs or intrusions from between which the sea has washed away the intervening strata. Conditions on the whole are decidedly ill adapted to the growth of mollusks, even the small rocks scattered among the larger knobs being, as a general rule, firmly embedded in fine, black, dirty, lava sand. The situation is therefore very unfavorable to the growth of mussels, abalones and other clear water species which abound elsewhere among granite rocks along the whole coast of California.

Directly in front of the village of Trinidad, however, there is exposed at low tide a mass of rocks most of which may be overturned, revealing many kinds of small shells. I took advantage of five low tides during the past summer to collect in the above-mentioned area, finding in the material taken two new species of *Odostomia* and one of *Turbonilla*. The following is a list of the species obtained by me. I am greatly indebted to Dr. Paul Bartsch of the United States National Museum for the determination of the minute forms.

PELECYPODA.

MYTILUS CALIFORNIANUS Conrad.

Not found in the immediate vicinity of Trinidad; common on the outer rocks.

MODIOLUS FORNICATUS Gould.

Fairly common.

PECTEN GIGANTEUS Gray.

Abundant, young specimens especially so.

PODODESMUS MACROCHISMA Deshayes.

One upper valve.

KELLIA LAPEROUSEI Deshayes.

CARDIUM CORBIS Martyn.

Broken valves only.

SAXIDOMUS GIGANTEUS Deshayes.

PAPHIA STAMINEA Conrad.

Very abundant in the sand about rocks.

PETRICOLA, species.

Fry, too young to determine.

MACOMA INQUINATA Deshayes.

SCHIZOTHAERUS NUTTALLI Conrad.

PHACOIDES CALIFORNICUS Conrad.

Young and dead specimens not rare.

ENTODESMA SAXICOLA Baird.

Relatively frequent.

GASTROPODA.

ANISODORIS NOBILIS McFlarand.

Several young specimens found under shelving rocks.

DIAULULA SANDIEGENSIS Cooper.

Abundant.

OLIVELLA BIPLICATA Sowerby.

Only one or two specimens.

CLATHROMANGILIA LEVIDENSIS Carpenter.

One young specimen.

CLASIA PYRIFORMIS Carpenter.

Common among corallines at lowest tide mark.

COLUMBELLA (ALIA) CARINATA Hinds

Common.

AMPHISSA CORRUGATA Reeve.

Very common.

PURPURA FOLIATA Martyn.

Frequent but in bad condition; among the larger rocks.

TRITONALIA LURIDA Middendorff.

Fairly common.

TRITONALIA INTERFOSSA Carpenter.

THAIS LAMELLOSA Gmelin.

Plentiful.

OPALIA WROBLEWSKII Mörch.

EPITONIUM INDIANORUM Carpenter.

MELANELLA MONTEREYENSIS Bartsch.

TURBONILLA, species.

New; to be described shortly by Doctor Bartsch.

ODOSTOMIA (CHRYSALLIDA) EUGLYPTA, new species.

Plate 1, fig. 1.

Shell minute, thin but fairly solid, rather broad; nuclear whorls large, inflated, somewhat eroded, evidently with quite strong spiral sculpture; postnuclear whorls 4, well rounded; sutures quite prominent; spiral ridges between the sutures 4, the lower one the strongest, crossed by numerous, fairly strong axial ribs which become weaker as they approch the outer lip; junction of transverse ribs and spiral ridges marked by prominent, blunt, rounded nodules; base moderate, with 7 flattish spiral bands, the upper ones the strongest, without any transverse ribs; aperture ovate, slightly produced below; columella with a fairly sharp fold; margin of outer lip scalloped, showing the external sculpture within. Color gray. Length 2.1 mm.; breadth 1.2 mm. Trinidad, California; among corallines, etc., under stones at lower water mark.

The type and two other specimens of this minute shell were obtained. The type is Cat. No. 334780 United States National Museum, the cotypes in the collection of Stanford University. The specimens were pronounced new by Doctor Bartsch.

ODOSTOMIA (EVALEA) EDMONDI, new species.

Plate 1, fig. 2.

Shell small, fairly solid, conic; surface more or less eroded, the sculpture, if ever present, no longer in evidence; nuclear whorls prominent, hardly immersed; postnuclear whorls nearly but not quite flat; sutures not very prominent, hardly channeled; base moderately long, evenly rounded; umbilicus very minute, closed; aperture egg-shaped; peristome almost complete; columella and inner lip with considerable callus and one oblique plait. Color gray. Length 3.1 mm.; breadth 1.8 mm. Trinidad, California.

One specimen, the type, was found, which is entered as Cat. No. 334787, United States National Museum. Named in honor of Mr. George W. Edmond, of Santa Monica, who first interested the author in the study of mollusca. The specimen was pronounced new by Doctor Bartsch.

ODOSTOMIA ANGULARIS Carpenter.

ODOSTOMIA DELICIOSA Dall and Bartsch.

ODOSTOMIA SKIDEGATENSIS Dall and Bartsch.

A number of specimens.

CERITHIOPSIS MONTEREYENSIS Bartsch.

Several.

BITTIUM ESCHRICHTII Middendorff.

Exceedingly abundant everywhere.

ALVANIA COMPACTA Carpenter.

Very common under stones; the smallest species found.

LACUNA COMPACTA Carpenter.

Very abundant on seaweed.

LACUNA PORRECTA Carpenter.

Even more abundant than the above.

LACUNA SOLIDULA Loven.

A few specimens of this unusually large species.

CREPIDULA NIVEA Broderip.

In the aperture of dead *Tegulas*.

CREPIDULA EXPLANATA Gould.

A few specimens on the under side of stones.

POLINICES LEWISII Gould.

One much worn example.

ACMAEA PELTA Eschscholtz.

Not overbundant.

ACMAEA PERSONA Eschsholtz.

Common.

ACMAEA MITRA Eschscholtz.

Common dead, living specimens not rare.

ACMAEA INSESSA Hinds.

A few from seaweeds.

ACMAEA INSTABILIS Gould.

Dead on beach, but no living specimens found.

ACMAEA PALEACEA Gould.

One specimen from corallines.

CALLIOSTOMA CANALICULATUM Martyn.

Dead juveniles.

CALLIOSTOMA COSTATUM Martyn.

Fairly common.

MARGARITES PUPILLA Gould.

Common under stones and among corallines.

MARGARITES LIRULATA Carpenter.

Common.

TEGULA FUNEBRALIS A. Adams.

Not rare but not nearly as common as further to the south.

HALIOTIS RUFESCENS, (probably subspecies WALLALENSIS Stearns.)

Not found at Trinidad, but said to be common at Patrick Point some miles to the north, where the lava rock gives way to granite.

FISSURIDEA ASPERA Eschscholtz.

Quite common under shelving rocks; large specimens much more frequently found here than further south.

TONICELLA LINEATA Wood.

Young specimens not rare but no large ones found.

POLYPLACOPHORA.

ISCHNOCHITON MERTENSI Middendorff.

A few about the base of eel-grass.

ISCHNOCHITON COOPERI Carpenter.

Frequent.

ISCHNOCHITON, species.

Too young to determine (*I. marmoratus.* Dall?).

ISCHNOCHITON, species.

Too young to determine.

MOPALIA LIGNOSA Gould.

On the under side of rocks embedded in sand.

MOPALIA CILIATA Sowerby.

Not very common.

MOPALIA HINDSI Sowerby.

Common on sides of rock grottoes.

MOPALIA, species.

Too young to determine.

PLACIPHORELLA VELATA Carpenter.

A few specimens.

KATHERINA TUNICATA Sowerby.

Common; on the upper side of rocks at about half tide.

CRYPTOCHITON STELLERI Middendorff.

Comparatively very common; around extreme low water mark.

So far as I know, the only other collector who has worked at Trinidad is Mr. C. N. Drake who several years ago (while principal of the Trinidad schools) made in this region a considerable collection, which he presented to the city library of Eureka. The Librarian, Mr. H. A. Kendal, kindly furnished me with a list of Mr. Drake's collection. It contains the following species in addition to those given above.

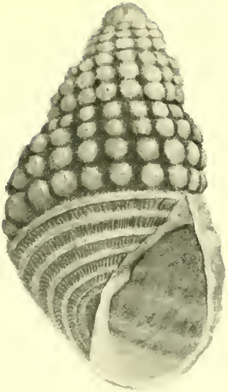
GASTROPODA.

GADINIA RETICULATA Sowerby.
OLIVELLA PEDROANA Conrad.
SEARLESIA DIRA Reeve.
COLUMBELLA (ALIA) GAUSAPATA Gould.
TRITONALIA CIRCUMTEXTA Stearns.
THAIS EMARGINATA Deshayes.
LITTORINA SCUTULATA Gould.
CRUCIBULUM SPINOSUM Sowerby.
CREPIDULA ADUNCA Sowerby.
NATICA CLAUSA Broderip and Sowerby.
ACMAEA PATINA Eschscholtz.
ACMAEA SPECTRUM Nuttall.
ACMAEA ASMI Middendorff.
ACMAEA SCABRA Nuttall.
TEGULA BRUNNEA Philippi.

SCAPHOPODA.

DENTALIUM PRECIOSUM Nuttall.

Once used as money by the Trinidad Indians.



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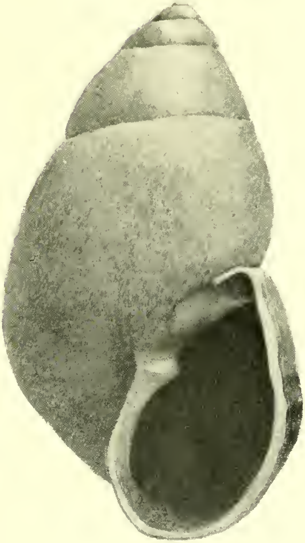

2

New Mollusks from Trinidad, California.

For explanation of plate see pages 2 and 3.

THE NORTH AMERICAN ICHNEUMON-FLIES OF THE TRIBES LYCORINI, POLYSPHINCTINI, AND THERONIINI.

By R. A. Cushman,

Of the Bureau of Entomology, United States Department of Agriculture.

INTRODUCTION.

This paper consists of revisions of the North American species of three of the tribes of the subfamily Ichneumoninae, the Lycorini, Polysphinctini, and Theroniini as defined by Cushman and Rohwer,[1] and is a contribution to a revision of the entire subfamily as represented in the North America fauna.

The drawings of the entire insects and many of the detail drawings are by Miss Mary Carmody, formerly of the Bureau of Entomology, United States Department of Agriculture.

Tribe LYCORINI Cushman and Rohwer.

This tribe includes the genera *Lycorina* Holmgren and *Toxophorides* Cresson as well as a new genus described below.

The two described genera have always been referred to the (Pimplini) Ichneumonini. The tribe is distinct from all the other tribes of the Ichneumoninae in the peculiar structure of the tergites. In this it superficially resembles the Glyptini, but is distinct from that tribe in having the first tergite apically similar in structure to the others and, in the female, in the form of the ovipositor and hypopygidium. These differences are of such nature that it is very doubtful if these two tribes have any real affinity. In the lanceolate ovipositor and pectinate claws the Lycorini are allied to the Phytodietini, but are readily separated by abdominal, propodeal, and other characters. With the latter tribe the Lycorini seems to have more in common than with any of the other tribes of the subfamily, but that the affinities between the two are very close seems rather doubtful.

The species so far as is known, are parasitic on the larvae of microlepidoptera.

Description.—Body stout; head in front view strongly transverse; eyes large, parallel within and usually slightly emarginate opposite antennae; malar space rather long, the malar furrow present; clypeus transverse, distinctly separated, rounded to subtruncate apically; frons concave, bounded laterally by a more or less distinctly elevated ridge; temples flat or weakly convex and very sharply sloping; occipital carina complete; antennae rather stout, subattenuate basally; the apical joint nearly or quite as long as preceding two combined, first joint of flagellum distinctly longer than the second, scape subhemispherical, barely emarginate at apex; pronotum with a sharp carinate tubercle on each side dorso-anteriorly; notauli obsolete or absent, prescutum long; scutellum quadrate or trapezoidal strongly carinate laterally; propodeum short, declivous behind, dorsal and posterior faces separated either by a more or less distinct carina or by difference in sculpture; metapleura not or indistinctly separated from propodeum; wings large; areolet absent, intercubitus nearly or quite twice as long as second abscissa of cubitus, basal vein straight or nearly, nervulus interstitial or nearly, nervellus strongly inclivous; front tibiae more or less swollen in middle and constricted at base and apex; claws strongly pectinate; abdomen stout ovate, first four tergites in female, five in male, with median triangular areas set off by oblique furrows and an apical transverse furrow, tergites beyond first also with deep basal furrow, fifth in female and sixth in male without the apical furrow; apical tergites in female retracted, hypopygidium reaching to or beyond apex of abdomen, membraneous in basal middle, ovipositor half or more as long as abdomen, compressed lanceolate apically.

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[1] Proc. U. S. Nat. Mus., vol. 57, 1920, p. 379–396.

The tribe is very homogeneous with very few generic characters. What characters there are however, are apparently very constant and have practically all been used in the following key to the genera.

KEY TO GENERA.

1. Propodeum sharply areolated, distinctly separated from metapleura; scutellum quadrate, truncate at apex; nervellus distinctly broken, subdiscoidella distinct; black with only clypeus and minute markings on head and scutellum yellow. *Lycorina* Holmgren.

Propodeum with at most an obsolete apical carina and traces of the median carinae, not separated from metapleura; scutellum trapezoidal, rounded apically; nervellus curved or striaght, not broken, subdiscoidella obsolete or absent; body highly ornamented .... 2.

2. Posterior face of propodeum perpendicular; apical carina obsolete; body black with yellow markings and thorax more or less reddish; wings immaculate. *Chlorolycorina* Cushman.

Posterior face of propodeum oblique, apical carina absent, dorsal and posterior faces of propodeum separated by difference of sculpture; body mostly yellow with blackish markings, at least without red; front wings usually infumate at apex .... *Toxophoroides* Cresson.

Genus LYCORINA Holmgren.

Lycorina HOLMGREN, Öfvers. Vet.-Akad. Forh., vol. 16, 1859, p. 126. *Genotype.*—*Lycorina triangulifera* Holmgren.

This genus is unknown in the North American fauna, the genotype and only described species being European.

Distinct by the characters employed in the key, in most of its other features it is very similar to the other genera of the tribe.

CHLOROLYCORINA, new genus.

In structure this genus stands between *Lycorina* Holmgren and *Toxophoroides* Cresson. In the perpendicular posterior face of the propodeum it is allied to *Lycorina* while differing from that genus in lacking all the carinae except the obsolete apical and traces of the median. In color pattern, which in this group is undoubtedly of generic value it is allied to *Toxophoroides.* From both genera the red color of the pleura distinguishes it.

Genotype.—(*Glypta* ?) *Toxophoroides scitula* (Cresson).

The species are readily distinguished by the color characters employed in the following key.

KEY TO SPECIES.

1. Hind tibiae with alternating bands of white and black, tarsi white at base; mesoscutum more or less red; triangular areas of tergites each with a white spot..*scitula* (Cresson).
   Hind tibiae white only basally, reddish in the middle, tarsi entirely black; mesoscutum without red; triangular areas of tergites immaculate........ 2.
2. Hind coxae red; ovipositor distinctly longer than hind tibiae. *albomarginata* (Cresson).
   Hind coxae black with apex white; ovipositor and hind tibiae equal in length. *soror* Cushman.

CHLOROLYCORINA SCITULA (Cresson).

Glypta scitula CRESSON, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 155, female. *Type.*—No. 1464, Acad. Nat. Sci. Phila.

? *Glypta* (*scitula* Cresson) WALSH, Trans. St. Louis Acad. Sci., vol. 3, pt. 1, 1873, p. 129, female.

Toxophoroides scitula (Cresson) VIERECK, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 196.

Glypta (*Toxophoroides*) *scitula* Cresson, VIERECK, Hym. Conn., 1917, p. 317.

Discussion based on type and two specimens compared with type by the present writer.

This species has been adequately described by both Cresson and Walsh. It is very distinct from the other two species of the genus by the characters used in the key.

The United States National Museum collection contains two females, one from Monticello, Florida, where it was reared October 7, 1914, by A. I. Fabis under Quaintance No. 10561 from *Tetralopha subcanalis* Walker; and the other reared June 10, 1885, under Bureau of Entomology No. 3722. A note by the late Theo.

Pergande in the bureau files relates to the rearing of the latter specimen; it is as follows: "A very curious cocoon of an Ichneumonid was found by Koebele on an apple tree on the Agricultural Grounds May 23, 1885. The cocoon is elongate, squarish, pointed toward both ends, light brown, and is held in place by three long threads, each thread being about equal in length and placed in such a position as to hold the cocoon between them suspended. The fly issued June 10."

The Florida specimen has more black, especially on the lateral lobes of the mesoscutum and scutellum, and is considerably larger than the type. The other specimen has the thorax less contrastingly colored with more red on the mesoscutum and scutellum.

The type is from New York.

CHLOROLYCORINA ALBOMARGINATA (Cresson).

Glypta albomarginata Cresson, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 157, female. *Type.*—No. 1465, Acad. Nat. Sci. Phila.

Toxophoroides albomarginata (Cresson) Viereck, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 645.

Discussion based on type, a female specimen compared with type by the present writer, one other female, and one male.

Distinct from *scitula* (Cresson) by the key characters.

The two National Museum female specimens show some color variation from the type, both showing red on the mesopleura. The specimen compared with the type also has the black of the front and middle coxae replaced by red. The male is very similar to the female, differing principally in having the face entirely pale.

The last mentioned female specimen was reared by C. R. Ely July 2, 1912, at East River, Connecticut, from *Ypsolophus bipunctellus* Walsingham, while the other female is from Cranmoor, Wisconsin, taken by C. W. Hooker on October 10, 1910. The male was reared by Dwight Isely at Bentonville, Arkansas, under Quaintance No. 16379 from *Canarsia hammondi* Riley. The type is from Maine. These are apparently the only known specimens.

CHLOROLYCORINA SOROR, new species.

Female.—Length 5 mm., ovipositor 1.5 mm.

Closely related to *albomarginata* (Cresson), from which it differs principally as follows: face with two narrow pale stripes in the black median area; malar space much shorter than basal width of mandible; hind coxae and trochanters black, the former white at apex; ovipositor not longer than hind tibia.

Head polished; face sparsely punctate; temples convex; thorax polished, sparsely punctate; scutellum broad and broadly rounded at apex; propodeum rather sparsely punctate; abdomen densely, finely punctate; ovipositor as long as hind tibia.

Black with color pattern of red and yellow as follows: orbits, mouth parts, two lines on face, lines in positions of notauli dilated anteriorly, dorsal margin of pronotum, tegulae, spot below, one at anterior edge of mesopleurum, one above base of middle coxa, one below hind wing, margin of scutellum, postscutellum, spot at top of propodeum, and apical and lateral margins of first five tergites yellow; metapleura rufous; wings hyaline, veins and stigma dark brown; coxae black at base, white at apex, the posterior pair practically all black; front trochanters, tibiae and tarsi white, their femora pale testaceous; middle femora pale testaceous; their tibiae and tarsi stramineous, apical joint of their trochanters black; hind trochanters black, their femora dark testaceous, fuscous at apex, tibia rufofuscous, white at base and with darker fuscous bands at apex and next to basal annulus, tarsi entirely fuscous; ovipositor sheath black, pale at apex

Type-locality.—Las Cruces, New Mexico.

Type.—Cat. No. 22143, U.S.N.M.

Described from one female.

Genus TOXOPHOROIDES Cresson.

Toxophoroides Cresson, Proc. Acad. Nat. Sci. Phila., 1873, p. 406. *Genotype.*—*Lycorina*? *apicalis* Cresson.

Toxophoroides Cresson, Viereck, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 195.

In both color and sculpture this genus stands at the opposite end of the tribe from *Lycorina*. From that genus and from *Chlorolycorina* it differs in the sloping posterior face of the propodeum separated from the dorsal face by difference in sculpture rather than by an obsolete carina. In most of the species the color is the reverse from that of *Chlorolycorina*, the ground color being yellow with dark markings. In an undescribed species represented only by two males in the United States National Museum collection, however, the black is more extensive than the yellow, but the entire lack of the red color of the pleura appears to be a constant generic character.

KEY TO SPECIES.

1. Front wings not distinctly infumate at apex..............*xanthozonata* (Ashmead).
   Front wings distinctly infumate at apex.................................... 2.
2. Head in dorsal view almost evenly ovate, temples convex, eyes not bulging, in front view eyes not higher than vertex....................*apicalis* (Cresson).
   Head in dorsal view not evenly ovate, temples flattened, eyes bulging, in front view eyes higher than vertex ....*glaucomatus* Cushman.

TOXOPHOROIDES XANTHOZONATA (Ashmead).

Glypta xanthozonata Ashmead, Proc. U. S. Nat. Mus., vol. 12, (1889), 1890, p. 449, male. *Type.*—Cat. No. 2117, U.S.N.M.

Toxophoroides xanthozonata (Ashmead), Viereck, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 195, footnote.

The unique type male, reared by Miss M. E. Murtfeldt in Missouri from a tortricid on oak, is extremely like *apicalis* (Cresson). It is very likely the male of that species, but since the infuscation of the apices of the wings is very weak and since it comes from such a widely different locality, it seems inadvisible to synonymize it.

In the type the propodeum can hardly be said to be distinctly divided transversely since the sculpture is so weak that it is inconspicuous.

TOXOPHOROIDES APICALIS (Cresson).

Lycorina (*Toxophoroides*) *apicalis* Cresson, Proc. Acad. Nat. Sci. Phila., 1873. p. 407, female. *Type.*—No. 635, Acad. Nat. Sci. Phila.

Lycorina apicalis Cresson, Dalla Torre, Cat. Hym., 1901–1902, p. 418.

Toxophoroides apicalis (Cresson), Viereck, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 195.

Discussion based on the type and a specimen compared with the type by S. A. Rohwer.

Both the specimens examined are from Mexico and hence out of the restricted area covered by the present paper, but the species is so closely allied to *xanthozonata* (Ashmead) and possibly identical with it that it is included.

The writer has not examined the type but Mr. Rohwer has done so and has compared a National Museum specimen with it. Mr. Rohwer was of the opinion that the two specimens are conspecific and made the following comparative notes: "The National Museum specimen is smaller, sculpture of abdomen not as dense but of the same type, and the black of the abdomen forms complete bands (in the type the black is separated medially on first by a very little but more widely on other segments)." Compared with Cresson's description this specimen also differs as follows: The maculation of the mesoscutum consists of three parallel streaks, one on the prescutum and one on each of the lateral lobes, and a triangular spot in front of the scutellum; in addition to the black markings mentioned by Cresson there is one on each side of pronotum, the two connected by a line, a large spot at base of propodeum, almost interrupted in the middle, and a small, nearly round median apical spot; only the apical joint of hind trochanters black; ovipositor nearly as long as abdomen; length 4.5 mm.

TOXOPHOROIDES GLAUCOMATUS, new species.

Closely related to *apicalis* Cresson, but easily distinguished by the prominent eyes and flat temples and vertex.

Female.—Length 9 mm., antennae 8 mm., ovipositor 3.5 mm. Head in front view very strongly transverse, the eyes large and prominent, the cheeks, temples, and vertex flat, the last below level of top of eyes; face slightly convex with a shallow longitudinal groove on each side, weakly punctate below antennae; head otherwise impunctate; pronotum almost without sculpture, anterior dorsal angles very sharp; mesoscutum and mesopleura polished, sparsely punctate, scutellum more densely and strongly so; metapleura more strongly, but not more densely, punctate; propodeum with very deep punctures which dorsally are arranged more or less in transverse rows and posteriorly in longitudinal rows, this difference together with a slight concavity of the sloping posterior face indicating the line of division of the propodeum into dorsal and posterior faces; median longitudinal carinae very briefly indicated at base; legs slender, hind basitarsus very nearly as long as other joints combined; abdomen sparsely though strongly punctate, the triangular areas practically without punctures; first tergite slightly longer than wide at apex, sides nearly straight.

Yellow with the following black or blackish markings: ocellar area, occiput dorsally, vertex posteriorly, elongate spot on prescutum, one on each of the lateral lobes coalescing posteriorly with a triangular spot in front of the scutellum, a spot on each side of mesosternum running up along prepectus then backward under front wing and narrowly connected with a large spot on the posterior margin of mesopleurum, a narrow transverse band at base of propodeum and a rounded apical spot, hind coxae basally, a band across middle of first tergite, a basal band on each of the next three tergites which is narrow medially and becomes dilated laterally to embrace the entire lateral elevated areas, and a broad band on fifth tergite; antennae pale beneath and at apex, dark brown above; wings hyaline, veins and stigma dark brown, apices of front wings fuscous; front and middle legs yellow; hind coxa at apex, the trochanter, tibia except at apex, and tarsi yellow, femur testaceous, tibia at apex reddish fuscous; ovipositor sheath black, yellow at apex.

The paratype differs practically only in being somewhat smaller, in having the black markings of the thorax somewhat larger, the mesosternum and mesopleura almost entirely black, a large spot on each side of pronotum, the alar region varied with piceous and the black of the fourth tergite entirely surrounding the triangular area.

Type locality.—Plummer's Island, Maryland.

Type.—Cat. No. 22144, U.S.N.M.

Described from two females both from the type locality, the type collected by S. A. Rohwer, June 20, 1911, and the paratype by H. L. Viereck, September 8, 1912.

Tribe POLYSPHINCTINI Cushman and Rohwer.

The genera comprising this tribe have heretofore been placed in the (Pimplini) Ichneumonini.

The present revision is based on the collection of the United States National Museum, but practically all of the types in various collections have been examined by either the writer or S. A. Rohwer, and the United States National Museum collection contains types, homotypes, or specimens compared with the types of most of the species discussed.

With a few exceptions the species of this tribe are rare. Most of them have been described from uniques, and some are still represented in collections solely by the types, while a few are known only from the original descriptions, the types having been lost or destroyed. Very likely with more specimens available for study some of the species would be found to be synonyms. Some synonymy has already been published and more is indicated in the present paper.

All of the species of which the habits are known are externally parasitic on spiders, the larva lying curved around the anterior margin of the abdomen of the host. These records include members of all the genera and subgenera except the new genus described below. As suggested by Marley [1] the European records of Gravenhorst and others ascribing hosts other than spiders to members of the genus *Polysphincta* are the result of the incorrect determination either of host or of parasite. The fullest and most interesting account of the attack of one of these insects on its host and the subsequent development is by Bignell [2] who watched a female of *Acrodactyla madida* Haliday attack its host, the spider *Linyphia obscura*. The polysphinctine cocoon is highly specialized, being usually loosely woven and having at the caudal end an opening through which the meconial discharge and exuvia are voided.

Most authorities have treated the genera *Acrodactyla* Haliday and *Zatypota* Foerster as subgenera of *Polysphincta* Gravanhorst while treating *Colpomeria* Holmgren as a distinct genus. But Foerster, followed by Ashmead, treated them all as genera. All of the writers who have considered these groups as subgenera also included *Zaglyptus* Foerster because of its incomplete areolet, although on all other characters it is much more closely allied to *Tromatobia* Foerster. Moreover, certain species of *Polysphincta* have the areolet fully defined, while the type of the new genus, *Zabrachypus*, has it pentagonal in position though open behind, almost exactly as in *Zaglyptus*. The character employed for separating *Colpomeria*, the angularly incrassate front femora, is a unisexual character, being found only in the female; but the cristulae on the front of the prescutum are common to both sexes and therefore of more value. This character will not separate *Colpomeria* from *Polemophthorus* Schulz (=*Symphylus* Foerster), which Morley [3] tells us is synonymous with *Acrodactyla* Haliday. In this synonymy Morley is in error if a specimen in the

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[1] Brit. Ichn., vol. 3, 1908, pp. 119-120.

[2] Trans. Devon. Assn., 1898, pp. 471-472.

[3] Brit. Ichn., vol. 3, 1908, p. 131.

National Museum labelled *Acrodactyla madida* Haliday is correctly determined, for this specimen lacks the cristulae, while Foerster's genus possesses them. In this respect *Polemophthorus* is more closely allied to *Colpomeria* and possibly synonymous with it. Since no specimen of *Polemophthorus* is available for study and Foerster does not state the structure of the tibiae it is impossible to form a definite opinion in regard to the synonymy. As regards the synonymy of *Oxyrrhexis* Foerster and *Acrodactyla* Haliday the same is true, since no specimen of the genotype of the former genus, *Oxyrrhexis carbonator* (Gravenhorst) is available. Judging, however, from the description of *carbonator* it seems improbable that the synonymy is well founded, for that species is said to have the abdomen very strongly punctate, whereas one of the most conspicuous characters of *Acrodactyla madida*, as represented in the United States National Museum, is its entirely impunctate abdomen. *Polemophthorus* and *Oxyrrhexis* will therefore be eliminated from further consideration because of the lack of specimens and because of the uncertainty of their affinities.

In the present paper *Acrodactyla* and *Colpomeria* are treated as genera, while *Zatypota* is considered as a subgenus of *Polysphincta*.

In general appearance and form, largely influenced by the abdominal structure, the genera comprising this tribe bear a very strong superficial resemblance to the typical Ichneumonini. But the very peculiar host-relations and the more minute structure, especially in the female, render them very distinct. These features are very reminiscent of certain genera of the Tryphoniae, such as *Monoblastus* Hartig and *Polyblastus* Hartig, and of the Paniscini.

Description.—Head strongly transverse, temples flat or slightly rounded, sloping sharply to the strong and complete occipital carina; face convergent below and at least as long as wide at clypeus, the latter convex or slightly flattened, usually rounded at apex, and frequently with a reflexed margin, rarely very weakly, broadly emarginate, never medially impressed or inflexed; mandibles narrow at apex, bidentate, the upper tooth the longer; eyes and ocelli large; antennae long, filiform. Thorax subovate, usually more or less distinctly compressed; notauli strongly impressed throughout, converging posteriorly, the prescutum very prominent, rarely broad and shallow, but in this case the prescutum is nevertheless very long and most of the other characters are especially well-marked; scutellum elevated and more or less distinctly compressed from the sides; propodeum rarely without carinae, frequently with two well-defined median areas, the petiolar and the confluent areola and basal area; wings broad, stigma rather small, usually narrow lanceolate, areolet rarely complete or even defined; third discoidal cell usually strongly narrowed basally, nervellus broken at, below, or not far above middle or unbroken; legs long, femora, especially the front pair, most frequently stout, last tarsal joint, claws and onychia large, claws in female with a large basal lobe or tooth, in male simple. Abdomen from short ovate to siblinear or long subclavate; first tergite usually sessile with prominent dorsal carinae, rarely subpetiolate with carinae distinct only at extreme base; middle tergites usually with distinct lateral elevations or with a median rhomboid area set off by grooves; ovipositor short, rarely half as long as abdomen, and with a distinct ventral swelling at or near the middle, whence it tapers to a very acute point; hypopygidium retracted far from apex of abdomen.

KEY TO GENERA.

1. Eyes and ocelli very large, posterior ocelli nearly touching the eyes, which are strongly emarginate, malar space practically obliterated; temples very flat or even concave and strongly convergent toward the unusually strong, flang-like occipital carina; clypeus subemarginately truncate (see fig. 1); long slender species mostly light colored, with abdomen parallel-sided or subclavate, slender legs, and fasciate wings (see pl. 2, fig. 1.)..............*Hymenoepimecis* Viereck.

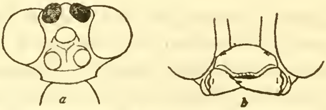

Fig. 1.—Hymenoepimecis wiltii (Cresson). *a*. Dorsal view of head; *b*, clypeus and mandibles.

Eyes and ocelli not especially large, posterior ocelli widely separated from eyes, malar space distinct; temples usually slightly convex and less strongly convergent, occipital carina not espedially strong; clypeus usually rounded at apex, rarely obscurely truncate (see fig. 2); shorter, stouter, darker colored species, with abdomen, at least in female, with sides usually arcuate, with stouter legs, shorter ovipositor, and hyaline, unfasciate wings (see pl. 2, fig. 2 and fig. 5.)..2.

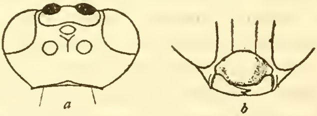

Fig. 2.—*a*, Polysphincta burgessi Cresson. Dorsal view of head; *b*, polysphincta (zatypota) braucheri Cushman. Clypeus and mandibles.

2. All tergites beyond second with furrows, impressions, and elevations obsolete; first tergite very narrow, nearly parallel-sided; stigma very narrow, its posterior margin curved, radius originating far before the middle; eyes rather small, shorter than width of frons..............................*Acrodactyla* Haliday.

Tergites beyond second with either furrows, impressions, or elevations distinct; first tergite broader, its sides divergent; stigma broader, its posterior margin angulate at origin of radius, which is usually not far before the middle; eyes longer than width of frons...3.

3. Prescutum cristate on each side; front and middle femora in female angularly incrassate in middle; (see fig. 3) first tergite nearly twice as long as wide at apex with sides gradually divergent.................... *Colpomeria* Holmgren.

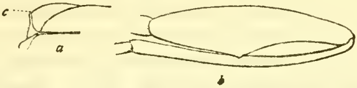

Fig. 3.—*a*, Colpomeria mellithorax Cushman. Lateral view of prescutum showing cristulae (*c*); *b*, Colpomeria kincaidii (Ashmead). Front femur and tibia of female.

Prescutum and femora normal; first tergite relatively much wider and with sides strongly divergent.. 4.

4. Tarsi normal; sternauli not deeply impressed; areolet entirely lacking or rarely oblique quadrangular................................ *Polysphincta* Gravenhorst.

Tarsi very short and thick, those of hind legs but little more than half as long as tibiae, first joint little more than twice as long as thick; body very short and thick; second intercubitus lacking but the areolet irregularly pentagonal in position; sternauli deeply impressed though short (see fig. 4).. *Zabrachypus* Cushman.

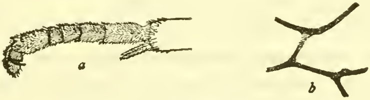

Fig. 4.—Zabrachypus primus Cushman. *a*, Hind tarsus of female. *b*, Areolet.

Genus HYMENOEPIMECIS Viereck.

Epimecis Brullé, Hist. Nat. Ins., Hym., vol. 4, 1846, p. 112. (Preoccupied in Coleoptera by *Epimeces* Billberg). *Genotype.—Epimecis bicolor* Brullé.

Hymenoepimecis Viereck, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 149.

Largely neotropical in its range, this genus is represented in our fauna by a single species. It exhibits to an extreme degree most of the features characteristic of the tribe. The very large, strongly convergent eyes; the narrow face; the large, prominent ocelli; the flat, or even concave temples, sloping sharply to the prominent occipital carina; the very prominently long and sloping prescutum, though not deeply impressed notauli; the elevated and compressed scutellum; the highly polished, slender body and legs; the largely bright reddish-testaceous color; and generally more or less infumated wings combine to make an insect of most striking appearance and easy recognition.

HYMENOEPIMECIS WILTII (Cresson).

Plate 52, fig. 1.

Epimecis wiltii Cresson, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 143. *Type.*—Acad. Nat. Sci. Phila., No. 1540.

Discussion based on homotype and other material.

The five females examined are very much alike, varying from 13 to 15 mm. in length and in the intensity of wing and abdominal color.

The male, two specimens of which are in the United States National Museum collection, differs from the female in the slightly greater extent of the dark color at the apex of the abdomen and hind legs and the somewhat reduced maculation of the wings.

Distribution.—Ohio (type); Pennsylvania; Cohasset, Massachusetts (homotype), Owen Bryant; Glencarlyn, Virginia, J. R. Mulloch; Black Pond, Difficult Run, Virginia, R. C. Shannon; Plummer's Island, Maryland (cocoon only), R. C. Shannon; South Carolina; Pyziton, Clay County, Alabama, H. H. Smith; Handley, Texas, W. D. Pierce; Onaga, Kansas, Crevecoeur.

Mr. R. C. Shannon has published[1] a very interesting account of the finding of a larva and subsequent rearing of a specimen of this species as a parasite of the spider. *Epeira trivittata.* This specimen, a male, is one of the series examined.

Genus ACRODACTYLA Haliday.

Barypus Haliday, Curtis, Guide Arrang. Brit. Ins., ed. 2, 1837, p. 94. (Preoccupied.) *Genotype.—Barypus degener* Haliday.

Acrodactyla Haliday, Ann. Mag. Nat. Hist., vol. 2, 1839, p. 117.

All remarks in the present paper relating to this genus are based on a specimen in the National Museum collection labeled *Acrodactyle madida* Haliday. This specimen differs markedly form Morley's idea of the genus. As thus typified the genus is not represented in the known North American fauna. The almost entire lack of either furrows or elevation on the tergites except the second, the subpetiolate abdomen with the very short and inconspicuous dorsal carinae of the first tergite, and the lack of prescutal cristulae render it very distinct from either of the other genera.

Genus COLPOMERIA Holmgren.

Colpomeria Holmgren, Ofvers, Vet.-Akad. Forh., 1859, p. 126. *Genotype.—Colpomeria laevigata* Holmgren.

This genus has been universally considered as a genus distinct from *Polysphincta* Gravenhorst. Morley[2] considers it very probably a synonym of *Scambus* Hartig, from which genus he states it differs only in the absence of the areolet. Morley's conclusion is obviously erroneous since the femoral character in *Colpomeria* is a secondary sexual character in the female and common to both front and middle legs, while in *Scambus* it is a male character and confined to the front legs. Moreover, in *Colpomeria* the femur is angularly incrassate in the middle while in *Scambus* it is concave in the middle. Davis fell into the same error when he described his *Colpomeria litoralis,* which is the male of *Epiurus pterophori* (Ashmead).

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[1] Proc. Ent. Soc. Wash., vol. 15, 1913, p. 162.

[2] Brit. Ichn., vol. 3, 1908, p. 137.

No specimen of the genotype has been available for study, but the two species discussed below, judging from previous characterizations of the genus, seem to belong here.

Colpomeria is very closely allied to *Polysphincta* and *Acrodactyla*, standing in general form and structure between those two genera. From both it differs in the incrassate femora in the female and in the possession of the prescutal cristulae. The following additional characters possibly of some generic value are common to all specimens at hand: head from above transversely oval; malar space subequal to basal width of mandible; propodeum longer than high, straight above with petiolar region declivous, median and apical carinae rather strong; abdomen narrowly sessile, subclavate, broadest at about apical third, first tergite nearly twice as long as wide at apex, its sides nearly straight and but slightly divergent, other tergites with the usual elevations and impressions rather weak; ovipositor gently upcurved and much shorter than first tergite; mediella strongly curved before the nervellus, which is strongly inclivous.

Only two species of this genus are at hand; these are separable on structural and color characters, which, in the small number of specimens available for study, seem to be constant.

KEY TO NORTH AMERICAN SPECIES.

Prothorax and mesothorax entirely bright testaceous; tergites laterally smooth. *mellithorax* Cushman.

Prothorax and mesothorax black or piceous at least dorsally; posterior tergites laterally with large suberased punctures .... *kincaidii* (Ashmead).

COLPOMERIA MELLITHORAX, new species.

Closely allied to *kincaidii*, but distinguishable from that species by the characters employed in the key.

Female.—Length 4.5 mm., ovipositor 0.3 mm., antennae (broken). Head polished, impunctate; eyes weakly divergent and not at all emarginate; ocell-ocular and postocellar lines about equal to each other and to diameter of lateral ocellus; malar space slightly longer than basal width of mandible; prothorax and mesothorax polished, the latter obscurely punctate below; metapleura and pleural areas polished, more or less rugosely roughened near the carinae; first tergite about three-fifths as wide at apex as long, carinae nearly reaching apex, polished between the carinae, dorsal surface outside the carinae somewhat longitudinally rugosely roughened and with a small low elevation beyond the middle; second tergite rugosely roughened laterally; abdomen otherwise polished and unsculptured.

Piceous black with prothroax and mesothorax entirely testaceous; legs yellowish white with coxae paler, hind tibia with distinct piceous apical annulus and a weaker one at about the basal third, this pattern obscurely repeated on middle tibia but with the dark color replaced by stramineous, middle tarsi with entire last joint and apices of all others pale testaceous or stramineous (the hind tarsi are broken off but undoubtedly have the same pattern with the annuli darker); tegulae and wing bases, scape and pedicel beneath (flagella wanting), mandibles and palpi white.

Type locality.—Unknown.

Type.—Cat. No. 20060. U.S.N.M.

A single female labeled "June 11, 1885, through C. V. Riley, 1888."

COLPOMERIA KINCAIDII (Ashmead).

Zaglyptus kincaidii Ashmead, Ins. Life, vol. 6, 1894, p. 260, female, male. *Type.*—Cat. No. 20061, U.S.N.M.

Discussion based on type, allotype, and two other females. Except in the characters given in the key this species is hardly distinguishable from *mellithorax* Cushman, described above, and it is possible that the two will, with more material for study, be found conspecific. In one specimen is shown a distinct tendency toward red in the thorax, this color including the mesosternum and a large part of the mesopleura, while the pronotum is distinctly reddish piceous. In the type and one of the other females the petiolar and lateral areas are only partially separated by carinae, while in the allotype and the other female the carinae are rather strongly complete. The females vary in length from 4.5 mm. (type) to slightly over 5 mm.

The types are from Olympia, Washington, where they were reared from a spider, *Tetragnathus* species, while the other two females are from Mount Washington, New Hampshire

Genus POLYSPHINCTA Gravenhorst.

In general form and structure this genus stands between *Colpomeria* Holmgren and *Zabrachypus*, new genus. It lacks the prescutal cristulae and, in the female, the femora, while usually considerable swollen, are not angularly incrassate as in *Colpomeria*. The head is somewhat more transverse and less regularly oval than in *Colpomeria;* malar space distinctly, usually much, shorter than basal width of mandible; propodeum not longer than high, usually shorter, arcuately declivous above, usually with at least the median carinae, frequently with two median areas, rarely without carinae; first tergite much more than half as wide as long, frequently as wide as long, its sides widely, arcuately divergent; other tergites with elevations or furrows distinct; ovipositor straight and at least nearly as long as first tergite, frequently much longer; mediella less strongly curved before the nervellus, which is either broken or unbroken and perpendicular or less strongly inclivous.

Although the extreme types of the two subgenera are very distinct the intermediate variation is rather gradual, and the characters employed in the following key, although stated positively, are really essentially comparative.

KEY TO SUBGENERA.

Middle tergites with more or less prominent lateral rounded elevations, the apical transverse furrows usually interrupted in the middle and reduced to broad impressions; abdomen smooth and polished or distinctly punctate; exscerted portion of ovipositor at least nearly as long as first tergites; generally larger, more slender species.......................................*Polysphincta* Gravenhorst.

Middle tergites with lateral elevation lacking, the apical furrow usually complete and sharply defined, and, with basal furrows, setting off a more or less distinct rhomboid or oval median area; abdomen usually finely shagreened, sometimes minutely transversely aciculate or polished; exserted portion of ovipositor much shorter than first tergite; generally smaller, stouter species...........*Zatypota* Foerster.

Subgenus POLYSPHINCTA Gravenhorst.

Polysphincta GRAVENHORST, Ichn. Eur., vol. 3, 1829, p. 112. *Genotype.—Polysphincta tuberosa* Gravenhorst.

Distinguishable from *Zatypota* in addition to the key characters by having the face usually broader, rarely distinctly longer than width at clypeus; notauli usually broad and shallow; legs stouter; intercubitus distinct, rarely very short; nervellus usually broken.

The species of this group are easily separated by the venational, clypeal, sculptural, and color characters used in the following key.

KEY TO NORTH AMERICAN SPECIES.

1. Abdomen strongly, coarsely punctate; hind tarsi black with only the basitarsus pale at base; entire length of ovipositor but little longer than first tergite; body entirely black...*texana* Cresson.
   Abdomen practically impunctate, polished, or occasionally, especially in males, more or less punctate in the depressions; entire ovipositor at least nearly twice as long as first tergite; thorax most frequently more or less reddish........ 2.
2. Clypeus white; body, except apical lateral spots on tergites, sanguineous; legs entirely white or whitish................................*albipes* Cresson.
   Clypeus piceous to black .... 3.
3. Clypeus somewhat flattened, short and broad, its apex more or less reflexed, in certain positions giving the impression of truncation..................... 4.
   Clypeus strongly convex, long, and strongly rounded and not reflexed at apex.. 6.
4. Mesothorax laterally largely testaceous.........................*koebelei* Howard.
   Mesothorax laterally mostly or entirely black............................ 5
5. Propodeum with median longitudinal furrow, but without carinae and polished; ovipositor approximately half as long as abdomen........*elongata* Cushman.
   Propodeum with longitudinal carinae and more or less irregularly rugulose; ovipositor distinctly less than half as long as abdomen...*burgessi* Cresson.
6. Wings with areolet...*slossonae* Davis.
   Wings without areolet...*strigis* Howard.

POLYSPHINCTA (POLYSPHINCTA) TEXANA Cresson.

Plate 2, fig. 2.

Polysphincta texana CRESSON, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 149, female *Type.*—Acad. Nat. Sci. Phila., No. 1,427.

Polysphincta vicina PROVANCHER, Nat. Can., vol. 5, 1873, p. 470, male. *Type.*—Pub. Mus. Quebec, 1877 Provancher coll.

Polysphincta bicarinata DAVIS, Trans. Amer. Ent. Soc., vol. 24, 1897, p. 369, female. *Type.*—Acad. Nat. Sci. Phila., No. 168.

Discussion and synonymy based on examination of type, types of both synonyms, homotype, and a number of other females and one other male, mostly in the United States National Museum.

This is the most abundant of all North American species of *Polysphincta*. Failure to comprehend the antigeny has caused the description of the male under at least two different names. Provancher considered females at first determined by him as *texana* to be the same as his *vicina*, but evidently still considered *vicina* as a valid species and *texana* as not occurring in his fauna. Dalla Torre (Cat Hym.) reduced *vicina* to synonymy with *texana*.

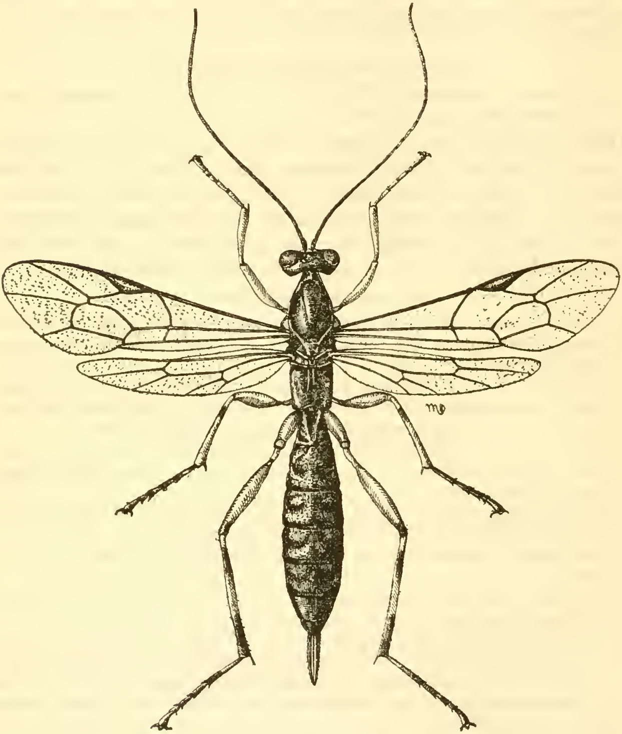

FIG. 5.—POLYSPHINCTA TEXANA CRESSON. FEMALE.

This species is very distinct from any of its subgeneric allies in its strong punctuation, intensely black hind tibiae and tarsi, the former with its white dorsal stripe and basal annulus and the latter with only the first joint white at base, and its snort ovipositor. The repetition of the color pattern of the hind legs in the middle and front legs is also much stronger than in any of the other species.

Clypeus about two-thirds as long as wide, rather more strongly convex and apically rounded than its closet relatives; postocellar and ocell-ocular lines and diameter of lateral ocellus nearly equal; mesoscutum opaque, densely, finely pubescent; propodeum subopaque; polished apically, median carinae distinct, parallel but sharply divergent posteriorly and obscurely joining the short lateral carinae, setting off a rather distinct petiolar area; metapleura weakly punctate and, with the propodeum, clothed with long pubescense; thorax otherwise polished, impunctate and mostly without pubescense; mesopleural furrow weakly foveolate.

There is considerable variation is some characters; the propodeal carinae in one female are very weak, the median carinae being practically absent and the surface of the propodeum is subpolished; the nervellus is usally broken at about the middle and perpendicular, but occasionally, notably in the single male in the United States National Museum, it is broken far below the middle and is inclivous; the front coxae vary from piceous through testaceous to whitish; the females range in size from 7 to 9 mm.

This species has a very wide range. Cresson's type is from Texas, Davis's from Idaho, and Provancher's from Canada. The National Museum specimens are from Ithaca, New York; Boulder, Colorado; Plateau Creek, Colorado; Cadet, Missouri; Vienna, Virginia; Santa Fe, New Mexico; and Menlo Park, California; with additional specimens labelled simply Missouri, Colorado, and Minnesota. The only breeding record is based on a specimen reared by the writer at Vienna, Virginia, on May 12, 1913. The host was the common spider, *Steatoda borealis*. An account of this rearing appeared in the Proceedings of the Entomological Society of Washington (vol. 15, p. 157).

POLYSPHINCTA (POLYSPHINCTA) ALBIPES Cresson.

Polysphincta albipes Cresson, Comstock, Rept. Ent., U. S., 1879 (1880), p. 208, male. *Type.*—Lost.

Careful search for the type of this species both in the Academy of Natural Sciences of Philadelphia and in the United States National Museum at the time Mr. Cresson was preparing the manuscript of his recent paper, The Cresson Types of Hymenoptera[1] failed to reveal it, and it has probably been destroyed. It was, however, a member of this subgenus and very closely allied to the next species if not the same.

The supposition that it was parasitic on a lepidopterous larva on the orange tree on which it was found in Florida is obviously erroneous.

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[1] Mem. Amer. Ent. Soc., No. 1, 1916

POLYSPHINCTA (POLYSPHINCTA) KOEBELEI Howard.

Polysphincta (*Zaglyptus*) *koebelei* Howard, Proc. Ent. Soc. Wash., vol. 2, 1892, p. 293, female. *Type.*—Cat. No. 2,684, U.S.N.M.

Discussion based on type, two other females, and two males.

From the description of *albipes* Cresson evidently closely allied to that species and very likely merely a darker form. Compared with the description of *albipes* a male and a female from Kansas differ only in color, the abdomen and propodeum being piceous with tergites black entirely across the apices, clypeus piceous, and coxae stramineous. These specimens are, however, much paler than the type both in body and leg coloration.

Female.—Polished with scattered, obscure punctures medially on tergites; clypeus much broader than long, deeply arched basally, broadly rounded and reflexed apically; malar space about half as long as basal width of mandible; face about as long as wide at clypeus; eyes slightly convergent below antennae, very weakly emarginate within; diameter of lateral ocellus, ocell-ocular, and postocellar lines about equal; temples and vertex rather strongly convex; notauli not especially strong but prescutum very long and low anteriorly; propodeum noncarinate but canaliculate medially; first tergite with carinae subobsolete beyond summit; tergites 2–5 strongly tuberculate laterally, 2–4 with deep apical and basal impressions, interrupted in middle; exserted portion of ovipositor twice as long as first tergite; stigma narrow, radius originating at basal two-fifths; intercubitus half as long as second abscissa of cubitus; nervellus weakly broken at about the lower third; hind basitarsus as long as next two joints together, last joint slightly shorter than third; antennae about three-fourths as long as body.

Male.—Very like female but more slender; temples nearly flat and less strongly sloping; antennae slightly longer.

Very variable in color. The type has the head, prothorax, upper hind angle of mesopleurum, metathorax except pleura, propodeum, and abdomen black to piceous; legs pale testaceous, front pair paler and hind pair darker, with front coxae, all trochanters in front, hind and middle femora at apices, and all tibiae and tarsi above whitish, darker below, hind tibiae and first two tarsal joints fuscous below and at apices. A female from Los Angeles, California, is very nearly typical, while one from Lawrence, Kansas, has the entire pro-and mesothorax testaceous, metathorax slightly darker, propodeum and abdomen piceous, the latter with the apices of the tergites black, and the legs pale stramineous, slightly darker basally and with the hind tarsal joints narrowly dark apically. A male from Lawrence, Kansas, is very like the female from the same locality, but slightly darker throughout, the hind tibiae displaying a very faint indication of the color-pattern of the type. A male from Los Angeles, California, has the body-color of the type, but the legs very contrastingly colored, the stramineous being replaced by white and more extensive and the testaceous brighter.

In size the specimens are very uniform, the smallest male being 7 mm. and the largest female 8 mm. long.

The above enumerated five specimens constitute the entire representation of the species in the United States National Museum, the distribution being Santa Cruz Mountains, and Los Angeles, California, and Lawrence, Kansas.

The type was reared from *Epeira strix* or *sclopetaria.* The cocoon is 7 mm. long by 3 mm. broad, very loosely woven and netlike. and pinkish brown.

POLYSPHINCTA (POLYSPHINCTA) ELONGATA, new species.

Very closely allied to *burgessi* Cresson, from which species it differs in its somewhat more slender form, in lacking the median longitudinal carinae on the propodeum, and in the distinctly longer ovipositor.

Female.—Length 9.5 mm., antennae (broken), ovipositor 3 mm.

Polished with a few weak punctures on mesosternum, laterally on propodeum, and in the impressions of the tergites, especially toward the apex of the abdomen; clypeus very broad and short with its apical rim so strongly reflexed as to give the appearance of truncation (this occurs to some extent in some specimens of *burgessi* Cresson, while in others it is not apparent); face distinctly longer than wide, eyes not convergent below antennae, weakly emarginate; ocell-ocular line shorter than postocellar line, diameter of lateral ocellus equal to the latter; temples flat; mesonotum highly polished, impuncate, and without pubescense, notauli weak posteriorly; propodeum with a deep longitudinal furrow in basal middle, but without carinae; first tergite considerably longer than wide at apex, its sides nearly straight and divergent, its carinae obsolete beyond the summit, not flattened dorsally; lateral tubercles strong on tergites 2–6, the apical impressions broad and interrupted in the middle, exserted portion of ovipositor very slightly decurved and very acute at apex, about half as long as abdomen; wings with transverse cubitus two-thirds as long as second abscissa of cubitus, nervellus distinctly broken not far below the middle; hind basitarsus barely as long as next two joints together.

Black; scutellum, postscutellum, and spots at bases of middle and hind legs piceous; apical part of clypeus and mandibles brown; palpi white; antennae blackish, somewhat paler beneath at base, especially at apex of scape; wing bases, tegulae and posterior angle of pronotum white; legs testaceous with the following pattern; front coxae apically, front trochanters, femora apically, apical segments of hind and middle trochanters and their basal joints at apex, all tibiae above, front tarsi, hind and middle tarsi above toward the base whitish or pale; hind femora rufo-fuscous; hind tibiae and tarsal joints except as noted fuscous; middle and front tibiae stramineous below; middle tarsal joints infuscated below, the apical joint entirely fuscous.

Type locality.—Mount Washington, New Hampshire.

Type.—Cat. No. 19171, U.S.N.M.

One specimen without further labels except the number 53.

POLYSPHINCTA (POLYSPHINCTA) BURGESSI Cresson.

Polysphincta burgessi Cresson, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 149, male. *Type.*—Acad. Nat. Sci. Phila., No. 1428.

Polysphincta limata Cresson, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 150, female. *Type.*—Acad. Nat. Sci. Phila., No. 1429.

Polysphincta bruneti Provancher, Nat. Can., vol. 5, 1873, p. 471, female. *Type.*—Derniere Provancher collection, Public Museum, Quebec.

Polysphincta rufopectus Provancher, Nat. Can., vol. 7, 1875, p. 140, female. *Type.*—Probably in Public Museum, Quebec, and labeled *Polysphincta limata*, since Provancher himself indicated the synonymy.

Discussion based on types and other material.

Distinct from *koebelei* Howard and *elongata* Cushman in its transversely roughened propodeum and the presence of the longitudinal carinae, from the former by its largely or entirely black mesothorax, and from the latter by its relatively shorter ovipositor and stouter form.

Clypeus, ocelli, and ocellar lines as in *koebelei;* sculpture of the body as in the latter species except that the propodeal carinae are present, the propodeum is more or less transversely rugulose, and the mesopleural furrow is minutely foveolate; entire ovipositor about three-fifths as long as abdomen; hind tibiae marked much as in *koebelei,* but more broadly blackish at apex and there is usually a more or less distinct subbasal dark annulus (in the type of *bruneti* the latter is entirely lacking); first three joints of hind tarsi white at base; color-pattern rather distinctly repeated on middle tibiae.

Except for slight differences in size, color, and sculpture of propodeum all the female specimens of this species are very much alike. The type of *rufopectus* is said to have the thoracic venter red. The same is true of two females in the Academy of Natural Sciences of Philadelphia and one in the United States National Museum, and of the male type of *burgessi.* In some other specimens the area immediately at the base of the middle coxae is somewhat reddish. The male differs from the female principally in its much more strongly sculptured, nearly opaque abdomen.

Apparently this species has never been reared. It appears to be largely northern in its range. Cresson's two types are from Massachusetts, Provancher's two types from Canada, of the seven specimens in the National Museum three are from Canada, one each from St. John, New Brunswick, Oswego, New York, and Terra Alta, West

Virginia, while in the Academy of Natural Sciences of Philadelphia there is one specimen each from New Hampshire, Pennsylvania, and Michigan.

POLYSPHINCTA (POLYSPHINCTA) SLOSSONAE Davis.

Polysphincta slossonae DAVIS, Trans. Amer. Ent. Soc., vol. 24, 1897, p. 368, female.
Type.—Acad. Nat. Sci. Phila., No. 169.

Discussion based on type, four other females, and three males.

Distinct from all other North American species of the genus in the possession of a complete areolet.

Female.—Clypeus strongly convex, not very deeply arched basally, strongly rounded and not reflexed apically; malar space very short; face distinctly longer than wide, barely convergent toward clypeus; inner margins of eyes weakly sinuous; temples weakly convex; notauli strong throughout; propodeum with dorsal carinae strong and extending more or less distinctly to apex, opaque laterally, posterior face transversely rugulose, polished above; legs very stout, tarsi very short, those of hind legs much shorter than tibiae, first joint as long as next three together, last joint fully as long as second; stigma fully a third as wide as long, radius originating in middle; nervellus strongly broken slightly below middle; first tergite with dorsal carinae strong and extending nearly to apex, irregularly rugulosely roughened; tergites 2-5 with decreasingly prominent lateral elevations and apical impressions, the latter broadly interrupted medially, more or less obscurely punctate basally; exerted portion of ovipositer about as long as first tergite.

Male.—Differs from female in having legs less stout, hind tarsi about as long as tibiae, basitarsus barely as long as next two joints together, tergites more strongly and extensively punctate, 2 and 3 entirely so except broad, polished apex.

Very variable in color, the female at one extreme having the body black to piceous except meso—and metapleura and sterna, scutellum, and large median posterior spot on mesoscutum, which are reddish; and small spot below each antenna, tegulae and spot in front, which are whitish. At the other extreme the head only is piceous, the thorax and abdomen testaceous, the latter more or less infuscate; and with the same white markings. In the male the scutellum, face (but not clypeus), propleura, and lower angles of pronotum are also white; while in the darkest specimen the mesoscutum and metathorax are entirely black or piceous. In the female the legs are stramineous with the apices of the hind femora, basal and apical annuli of hind tibiae, and apices of hind tarsal joints dark, this color pattern being faintly repeated on the middle legs; in the hind femur the apical annulus extends well toward the base as a narrow line down the outside. Apparently the species is darker colored in the eastern part of its range and lighter in the western part.

Davis's types came from Mount Washington, New Hampshire; the National Museum material consists of two females and two males from Nerepis, New Brunswick (A. G. Leavitt), a female from Southern Illinois (Robertson), a female from Colorado, and a female from Sonoma County, California.

POLYSPHINCTA (POLYSPHINCTA) STRIGIS Howard.

Polysphincta (*Zatypota*) *strigis* HOWARD, Proc. Ent. Soc. Wash., vol. 2, 1892, p. 291, female. *Type.*—Cat. No. 2682, U.S.N.M.

Discusion based on type and three other females.

This species stands as a connecting link between the subgenera *Polysphincta* and *Zatypota*, but is referred to the former on account of the prominent lateral elevations of the tergites and the long oviposter. In the almost obliterated intercubitus, the complete apical furrows on the tergites, and the unbroken nervellus it is allied to *Zatypota*.

Head and thorax polished; clypeus strongly convex, apex and clypeal furrow evenly arched; malar space nearly as long as basal width of mandible; face much longer than wide below, weakly convergent toward clypeus, with a median longitudinal elevation; eye barely sinuate within; temples rather strongly rounded; mesoscutum obscurely punctate, notauli complete and strong; propodeum with dorsal carinae strong, parallel to middle where they curve outward and extend to the lateral carinae, which extend forward to about the middle; legs slender, hind tarsus nearly as long as tibia, basitarsus shorter than next two joints combined, last joint about as long as third; intercubitus very short, stigma rather broad, radius in middle; nervellus unbroken; first tergite with carinae strong to beyond middle and a very deep oblique impression apically on each side; tergites 2–5 with rather prominent lateral elevations, 2 and 3 with complete apical impressions; ovipositor more than one and a half times as long as first tergits.

Black to piceous, with mesothorax piceous to rufous; legs stramineous, with hind femur more or less fuscous out side, apices of hind and middle tibiae and their tarsi except basal half of basitarsi, and faint indication of basal annulus fuscous, darker on hind legs.

The type was reared from *Epeira strix* at Seacliff, Long Island. Dr. L. O. Howard has described its cocoon in connection with his description of the species. One of the other specimens is from Oswego, New York, one from Vancouver, British Columbia, and the third, which is in the Fitch collection, probably from New York.

Subgenus ZATYPOTA (Foerster) Schmiedeknecht.

Zatypota (Foerster) SCHMIEDEKNECHT, Verh. Nat. Verh. Preuss. Rheinl., vol. 25, 1868, p. 166; Zool. Jahrb., vol. 3, 1888, p. 433. *Genotype.—Ichneumon percontatoria* O. F. Muller.

Differs from the subgenus *Polysphincta* by the characters used in the subgeneric key and usually by the following: Face narrower, distinctly longer than wide at clypeus; notauli more deeply impressed and complete; legs more slender; intercubitus nearly or quite obliterated; nervellus not broken.

Most of the species have been described as species of *Polysphincta*. *Glypta parva* Cresson, *Clistopyga alborhombarta* Davis, and *Clistopyga nigrocephala* Davis belong here, while *Polysphincta* (*Zatypota*) *strigis* Howard is here referred to the subgenus *Polysphincta* because of its tuberculate tergites and long ovipositor.

KEY TO NORTH AMERICAN SPECIES.

1. Tergites polished with, or without transverse aciculations on median area .. 2.
Tergites distinctly, finely shagreened .... 3.
2. Abdomen black with rhomboidal areas whitish; radius originating at middle of stigma .... *alborhombarta* (Davis).
Abdomen paler and with dark and light colors in reverse arrangement; radius originating before middle of stigma .... *dictynae* Howard.
3. Black or blackish without definite markings; carinae of first tergite strong nearly to apex, area between deeply impressed .... 4.
Brownish with yellowish markings; carinae of first tergite obsolescent beyond summit of tergite, space between flat .... 5.
4. Rhomboidal areas of tergites distinctly set off, impressions striate; hind femur at apex and tibia subbasally not black .... *theridii* Howard.
Rhomboidal areas not distinctly set off, impressions not striate; hind femur at apex and tibia subbasally black .... *pontiaci* Viereck.
5. Median carinae of propodeum present; petiolar area more or less defined ..... 6.
Median carinae absent, sometimes replaced by a median groove; petiolar area not at all defined .... 8.
6. Temples nearly flat; postocellar line longer than ocell-ocular line, diameter of lateral ocellus about equal to latter; mesoscutum subpolished shagreened, much longer than wide, prescutum long .... *braucheri* Cushman.
Temples strongly rounded; postocellar and ocell-ocular lines subequal, diameter of lateral ocellus less than either .... 7.
7. Mesoscutum red, opaque shagreened, prescutum short and broad; hind tibia with a subbasal black annulus; apical carina of propodeum practically wanting, petiolar area shagreened .... *nigrocephala* (Davis).
Mesoscutum piceous, polished, prescutum long and narrow; hind tibia black only at apex; apical carina of propodeum strong, petiolar area polished *granulosa* Davis.
8. Temples flat; second tergite broader than long; first tergite a half wider at apxe than at spiracles .... *californiensis* Cushman.
Temples rounded; second tergite about as broad at apex as long; first tergite much less than a half wider at apex than at spiracles 9
9. Nervellus unbroken and strongly inclivous; hind tarsi much shorter than tibiae; mesoscutum granularly subopaque .... *crosbyi* Cushman.
Nervellus broken, perpendicular; hind tarsi nearly as long as tibiae; mesoscutum polished .... *parva* (Cresson).

POLYSPHINCTA (ZATYPOTA) ALBORHOMBARTA (Davis).

Clistopyga alborhombarta Davis, Ent. News, vol. 6, 1895, p. 198, female. *Type.*—Acad. Nat. Sci. Phila.

Discussion based on type and one other female, the latter in the United States National Museum.

Female.—Length 5.5 mm., antennae 4 mm., ovipositor two-thirds the length of first tergite. Polished with propodeum posteriorly and metapleura slightly roughened; propodeum areolated, only the anterior transverse carina missing; first tergite much longer than wide, longitudinally striate and with dorsal carinae strong to apex; following tergites polished with deeply set-off rhomboidal areas, the furrows more or less striate; malar furrow present, nearly as long as basal width of mandible; temples slightly rounded, sharply sloping; radius originating at middle of stigma; nervellus unbroken; nervulus postfurcal; intercubitus nearly obliterated.

Black with face, upper orbits, mouth, scape and pedicel beneath, notauli, lateral margins of mesoscutum, margin of pronotum, tegulae, spot below, scutellum, postscutellum, rhomboidal areas of tergites except third, and legs (largely) white or whitish; sterna and pleura of mesothorax and metathorax red; hind femur with dark blotch above near apex; articulations of trochanters blackish; hind tibia black with broad white annulus; tarsi fuscous, the joints more or less whitish at base; same color pattern repeated on other legs, but paler.

The National Museum specimen differs from the type principally in having the white of the head and thorax less extensive, the legs more red, the metathorax entirely black, and the mesopleura and sternum piceous with only a small red spot below on pleurum.

Davis's type is from Florida, while the National Museum specimen was taken at Rosslyn, Virginia, by R. C. Shannon.

POLYSPHINCTA (ZATYPOTA) DICTYNAE Howard.

Polysphincta dictynae Howard, Ins. Life, vol. 1, 1888, p. 107, fig. 21, male. *Type.*—Cat. No. 2681, U.S.N.M.

Polysphincta minuta Davis, Trans. Amer. Ent. Soc., vol. 24,1897, p. 369, female. *Type.*—Acad. Nat. Sci. Phila.

Discussion based on types of both names, a homotype of *minuta,* and one other female.

Originally described from a unique male, reared by J. H. Emerton, from *Dictyna volupis* at Waltham, Massachusetts. The type is very likely not fully colored, the darker colored portions of the body being a rather pale brown, while in the females mentioned above they are very dark brown to black. It was later redescribed in the female by Davis from a specimen from Agricultural College, Michigan.

Female.—Length 3.5 mm., antennae 2 mm.

Head polished, face with dense, short pubescense; malar furrow present, as long as basal width of mandible; clypeal suture weak; temples strongly convex; apex of scape barely oblique, pedicel nearly as long as scape; prothorax polished, thorax otherwise subpolished, obscurely punctate, and, especially above, pubescent; mesoscutum nearly as wide as long, prescutum short and broad; propodeum with a long dorsal median and a petiolar area more or less distinctly separated, the areas polished; first tergite hardly longer than wide, its sides straight and divergent, carinae obliterated shortly behind summit of tergite, longitudinally rugulose; tergites 2 to 4 with median areas polished or obscurely transversely rugulose, second nearly twice as wide as long; intercubitus very short; nervellus straight, perpendicular; hind tarsi stout, much shorter than tibia, basal joint about as long as next two together.

Piceous to black with yellowish markings and legs; head black with more or less of face below antennae, apex of clypeus, scape and pedicel, mandibles, and palpi yellow; thorax piceous with more or less extensive yellow markings as follows: Hind angles of pronotum, lateral margins of mesoscutum and notauli, mesopleura below tegulae, tegulae and scutellum; propodeum black; abdomen piceous, paler toward apex; tergites 2–5 with apical areas yellow, first with this reddish piceous; legs yellow with a tendency to testaceous on coxae and femora, hind tibiae at apex and tarsi fuscous.

Male.—Very like female, but thorax and abdomen more highly polished, practically without sculpture; carinae of first tergite strong to apex. Paler throughout than female, but with pale color somewhat more extensive, the face and clypeus being entirely yellow, and the legs paler with only the slightest indication of the dark color on hind tibiae and tarsi.

The National Collection contains two female specimens, one from Chiric Mountains, Arizona, H. G. Hubbard; and the other from Colorado, Baker. The former is a homotype of *minuta* Davis.

POLYSPHINCTA (ZATYPOTA) THERIDII Howard.

Polysphincta theridii Howard, Proc. Ent. Soc. Wash., vol. 2, 1892, p. 292, male.
Type.—Cat. No. 2683, U.S.N.M.

Both specimens are in very poor condition, being covered with a white substance that very largely obscures the characters. The following features can, however, be seen: malar space nearly as long as basal width of mandible; face medially longitudinally elevated; temples convex, sharply sloping; propodeum with well-defined median areas; rhomboidal areas of tergites distinctly set off, shagreened, impressions striate, apices polished; legs slender; intercubitus short but distinct; nervellus not broken.

Black; abdomen brownish; mouth and scape pale; tegulae and humeral angles of pronotum white; legs testaceous, anterior paler, hind coxae inclined to piceous; hind tibiae white with apices dark fuscous, their tibiae fuscous.

POLYSPHINCTA (ZATYPOTA) PONTIACI Viereck.

Polysphincta pontiaci VIERECK, Hym. Conn., 1917, p. 318, male. *Type.*—Conn. Agr. Expt. Sta., New Haven, Conn.

Discussion based on notes by S. A. Rohwer, who has examined the type and only known specimen.

Differs from *theridii* Howard in the indistinctly defined rhomboidal areas of the tergites; in having the front and middle legs paler; the apices of the middle tibiae and hind femora brownish; and the hind tibia with a subbasal black annulus.

POLYSPHINCTA (ZATYPOTA) NIGROCEPHALA (Davis).

Clistopyga nigrocephala DAVIS, Trans. Amer. Ent. Soc., vol. 24, 1898, p. 369. *Type.*—Acad. Nat. Sci. Phila.

Female.—Length 4 mm., antennae 2.8 mm., ovipositor 0.3 mm. Discussion based on type, homotype, and one female.

Head polished, temples rounded, eyes converging slightly toward the mouth, barely emarginate; face slightly longer than wide; malar space about half as long as basal width of mandible; postocellar and ocell-ocular lines about equal and somewhat greater than diameter of lateral ocellus; thorax minutely shagreened, mesopleura subpolished; mesoscutum but little longer than wide, the prescutum before notauli about one-fourth the total length of mesoscutum; median carinae of propodeum present, the apical carina obscurely defined; abdomen short and broad, its sculpture the same as the thoracic, subpolished at apex and apices of tergites; first tergite a half longer than wide, its sides angulate at the spiracles, dorsal carinae obsolete beyond summit, space between depressed; tergites 1–4 with complete well-defined apical furrows, all tergites beyond first transverse; ovipositor very short, its exserted portion hardly half as long as first tergite; nervellus straight (left wing) or broken very near bottom (right wing); hind tarsus somewhat shorter than tibia, its basitarsus about as long as next two joints together.

Rufo-testaceous with head black and propodeum and abdomen blackish, the latter marked with yellow; palpi, mandibles, and apex of clypeus reddish; antennae brown, pale beneath at base; mesoscutum pale testaceous; scutellum stramineous; pronotum, mesopleura, metapleura rufo-testaceous, the first below and sterni infuscated; wing bases, tegulae, spot below, and posterior angle of pronotum white; metanotum and propodeum blackish as are also the tergites, except that tergites 2–4 incline to yellowish toward base; front and middle legs stramineous, the front pair somewhat paler, coxae and trochanters of both pairs white; hind coxae testaceous, whitish at apex, trochanters white, femora fusco-testaceous, whitish at apex, tibiae fuscous with white annuli at base and in middle, tarsi fuscous, very narrowly pale at base of first joint.

Male.—Length 4 mm., antennae (broken).

Differs from the female principally in color, the dark color of the body being more inclined to piceous, and the red color having less of the red and more of the fuscous, the legs and mouth paler, scape and pedicel white, scutellum whitish; the tergites are proportionately narrower and the impressions less distinct; hind tarsi about equal in length to tibiae.

The type is somewhat more contrastingly colored than indicated in the above description, which is drawn from the homotype.

The type is from Illinois, the homotype from Indiana, and the female from Washington, District of Columbia.

POLYSPHINCTA (ZATYPOTA) GRANULOSA Davis.

Polysphincta granulosa DAVIS, Trans. Amer. Ent. Soc., vol. 24, 1897, p. 369, female.
Type—Acad. Nat. Sci. Phila., No. 170.

Discussion based on type.

Allied to *nigrocephala* (Davis), from which it differs in addition to the characters used in the key as follows: prescutum before notauli narrow, about one-third total length of mesoscutum; first tergite nearly as wide at apex as long, not angulate at spiracles, dorsal carinae rather strong; apical furrows of tergites weak, interrupted medially, rhomboidal areas rather weakly defined.

Piceous to black, without distinct yellow markings on thorax or abdomen; mouthparts, apex of clypeus, antennae below at base, tegulae, spot below and one in front white; legs as in *nigrocephala,* but paler and lacking basal black annulus on hind tibia.

The type is the only known specimen.

POLYSPHINCTA (ZATYPOTA) BRAUCHERI, new species.

Allied to *nigrocephala* (Davis), from which it differs as follows:

Female.—Length 5.5 mm., ovipositor 0.5 mm., therefore considerably larger; temples flat; postocellar line slightly longer than ocell-ocular line, the latter about equal to diameter of lateral ocellus; mesoscutum considerably longer than wide, subpolished, prescutum much longer, about one-third total length of mesoscutum; second tergite nearly as long as wide, the abdomen as a whole more slender; nervellus curved at base; hind basitarsus nearly as long as next three combined.

Color pattern same as in *nigrocephala,* but pronotum, except dorsal and hind margins, and mesoscutum, except notauli and dorsal impressions, piceous; antennae beneath and mouthparts paler; hind femora testaceous.

Male.—Length 5.0 mm. Very like female with abdomen more slender and dorsal areas less well defined.

Type locality.—Douglas, Michigan.

Other locality.—Lafayette, Indiana.

Type.—Cat. No. 19173, U.S.N.M.

Described from one female and two males, the type, allotype, and paratype *a*, from the type-locality, where they were reared under Quaintance No. 5939, July 14-17, 1908, by R. W. Braucher "from cocoons attached by end to under side of large limbs in peach orchard"; and two males, paratypes *b* and *c*, reared under Webster No. 1186, from cocoons found on cedar, at Lafayette, Indiana.

Paratypes *b* and *c* are somewhat smaller than the allotype and *b* differs from that specimen in having the thorax except the scutellum and the region around the wing bases dark piceous.

The cocoons of the Michigan specimens are pure white, about a third of an inch long by a third as wide, coarse netlike. Those of the Indiana specimens are similar but smaller and yellowish.

POLYSPHINCTA (ZATYPOTA) CALIFORNIENSIS, new species.

Allied to *nigrocephala* (Davis) and *braucheri* Cushman, from both of which it can at once be distinguished by the lack of propodeal carinae.

Female.—Length 6 mm., antennae (broken), ovipositor 0.3 mm.

Head polished; temples flat; postocellar and ocell-ocular lines equal and about a half greater than diameter of lateral ocellus; malar space half as long as basal width of mandible; apex of scape much less oblique than usual; face slightly longer than wide; thorax subpolished, obscurely shagreened; propodeum finely shagreened and with a shallow furrow in basal middle; abdomen shagreened, subpolished at apex and at apices of tergites; first tergite one and a half times as long as wide, twice as wide at apex as at spiracles, its sides straight with spiracles barely protruding, its anterior basin very short with the carinae not extending beyond the summit, its dorsal surface with a weak median impression and strong oblique lateral impressions; rhomboidal areas strongly defined; second tergite but little wider than long; transverse cubitus subobsolete; nervellus straight; hind basitarsus barely longer than next two joints together.

Pale brownish rufous with head black; prescutum in front, pronotum in front both dorsally and laterally, prosternum and mesosterum, propodeum and first tergite, tergites 2–5 except basal third, which is yellow, and all of remaining tergites of varying shades of fuscous and rufo-fuscous, the paler shades being on apical tergites and disks of middle tergites; scutellum yellow; mandibles, apex of clypeus, palpi, scape, pedicel, wing bases, tegulae, humeral angle of pronotum, and spot below tegula white; front and middle legs whitish with femora and tarsi stramineous; hind coxae and femora testaceous, the latter infuscated toward tip with extreme apex white, trochanters white, tibia white with an obscure brownish annulus near the base and a broad nearly black one at apex, tarsi fuscous the first joint whitish at extreme base.

Type locality.—Santa Cruz Mountains, California.

Type.—Cat. No. 19174, U.S.N.M.

A single female bearing the Bureau of Entomology No. 23502, which refers to a note in the Bureau files that records the specimen as having been reared, but from what host is not known.

The cocoon is about a third of an inch long by a third as wide, loosely woven and net-like, and pale pinkish-brown in color.

POLYSPHINCTA (ZATYPOTA) CROSBYI, new species.

Allied to *californiensis* Cushman but easily distinguished by its convex temples, longer second tergite, and generally more slender form and darker color.

Female.—Length 4.5 mm., antennae 3.5 mm., ovipositor 0.3 mm.

In addition to the above characters this species may be distinguished from *californiensis* by the following: First tergite with its sides concave between the spiracles and the apex, the latter prominent; second tergite about as long as wide at apex; transverse cubitus distinct.

Color pattern same as in *californiensis* but darker throughout, metasternum as well as prosternum and mesosternum black, all coxae and femora testaceous, those of front and middle legs somewhat paler, tibiae with the usual annuli, testaceous on middle and fuscous on hind tibiae; pale bands of abdomen narrower.

Male.—Length 4.0 mm., antennae 2.5 mm. Differs from female in having venter of thorax and appendages paler throughout, though dorsally not materially different, except that pale bands of abdomen are even less distinct; propodeum with furrow stronger, almost carinate; first and second tergites relatively somewhat shorter, the first with sides straight and spiracles not prominent.

Type locality.—Oswego, New York.

Other locality.—McLean, New York.

Type.—Cat. No. 19175, U.S.N.M.

Two specimens, the type collected July 1, 1897, and the allotype evidently reared under Cornell University No. 891 on November 3, 1911, by C. R. Crosby, for whom the species is named.

POLYSPHINCTA (ZATYPOTA) PARVA (Cresson).

Glypta? parva Cresson, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 155, female. *Type.*—Acad. Nat. Sci. Phil., No. 1440.

(*Glypta?*) *Oxyrrhexis parva* (Cresson) Viereck, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 642.

Discussion based on the type, a female compared with the type, and one male.

Chiefly remarkable for its broken servellus and long tarsi.

Female.—Length 5.5 mm., antennae 4.0 mm., ovipositor 0.5 mm. Head in front view very broad, the eyes large and prominent, strongly convergent within; oral region protuberant; malar space nearly as long as basal width of mandible; temples rather strongly convex; head polished. Thorax polished; notauli strong, prescutum long; propodeum shagreened, weakly, briefly canaliculate medially at base, noncarinate; legs long, slender, hind tarsus nearly as long as tibia; stigma broad with radius in middle; intercubitus very short; nervellus distinctly broken in lower third, perpendicular. Abdomen rather slender, shagreened, polished apically and on the apical areas of the tergites, median areas distinct on tergites 2–4, weak on 5; first tergite much longer than broad, sides rather weakly divergent, spiracles rather prominent; second tergite about as long as wide at apex.

Head black; mandibles, palpi, and scape and pedical below white; face and clypeus piceous; thorax testaceous; pronotum and propodeum piceous; tegulae and humeral angles of pronotum white; front and middle coxae and all trochanters stramineous; hind tibiae white with small basal and large apical annuli fuscous, their tarsi fuscous except pale annulus at base of basitarsus; legs otherwise of various shades of testaceous; abdomen piceous, darker on apices of the tergites and with a tendency to yellowish at bases of tergites.

Male.—Length 5 mm.

Eyes even more prominent than in female; thorax bright reddish piceous; scutellum, mesopleura below, and mesisternum rufous; lower margin and humeral angle of pronotum, propleura, a large spot on upper angle of mesopleurum, and tegulae white; peopodeum and abdomen as in female with a somewhat greater tendency to yellow at the bases of the tergites; legs white except extreme bases of hind coxae, base and obscure external stripe of hind femur, base and apex of hind tibiae, hind tarsus, except white basal half of basitarsus, and the same color pattern on the middle tibia and tarsus faintly indicated, all of which are more or less infuscate.

The type is from Illinois, while of the National Museum specimens the female is from Los Angeles County, California, and the male from Bolton, New York.

SPECIES WRONGLY PLACED IN GENUS AND UNRECOGNIZABLE SPECIES.

Polysphincta acuta Provancher, Nat. Can., vol. 12, 1880, p. 44, female.

S. A. Rohwer, who has examined the type, says that what is left of it (the abdomen and apices of the antennae are gone) is very like *Clistopyga canadensis* Provancher. But the shape of the abdomen and the long ovipositor as described by Provancher exclude it from that genus. From *Polysphincta* its long ovipositor and short first tergite differentiate it. Except for the lack of an areolet it might be an *Epiurus;* or even without the areolet it may be a *Tromatobia,* though here the short first tergite is out of place.

(*Polysphincta cingulata* PROVANCHER)=*Tromatobia rufovariata* (Cresson).
Polysphincta nigriceps WALSH, and
Polysphincta nigrita WALSH, Trans. Acad. Sci., St. Louis, vol. 3, 1873, p. 144.

The types of the last two species have been destroyed and it is possible only to conjecture what they were. From Walsh's careful descriptions, however, it is evident that they were both species of *Zatypota* and closely allied to *nigrocephala* (Davis).

Polysphincta pimploides WALSH, Acad. Sci. St.Louis, vol.3, 1873, p. 145,

If this is properly referred to the genus, as seems very doubtful, it is very distinct by reason of the very long ovipositor. I know of no species that approaches it in this respect.

(*Polysphincta pleuralis* PROVANCHER)=(*Bassus*) *Diplazon pulchripes* (Provancher).
(*Polysphincta rubricapensis* PROVANCHER) = (*Pimpla*) *Zaglyptus incompletus* (Cresson).
(*Polysphincta spinosa* DAVIS)=(*Pimpla*) *Zaglyptus incompletus* (Cresson).
Polysphincta rufigastra (ASHMEAD)=(*Pimpla*) *Zaglyptus animosus* (Cresson). Isotypic, Ashmead having redescribed Cresson's type.

ZABRACHYPUS, new genus.

Differs from *Polysphincta* principally by the characters used in the foregoing key to genera. Its short, stout body with stout legs, very short tarsi, deep sternauli, and incomplete pentagonal areolet render it very easily recognizible.

Head distinctly narrower than thorax; malar space shorter than basal width of mandible; antennae stout; thorax nearly as high as long; propodeum very short, without either carinae or longitudinal groove; sternauli deep; legs stout, tarsi very short and thick; second intercubitus indicated by thickenings in cubitus and radius, the areolet irregularly pentagonal in position but open behind; first tergite broad with sides widely divergent; other tergites strongly transverse, elevations and impressions weak; exserted portion of ovipositor subequal in length to first tergite.

Genotype.—*Zabrachypus primus* Cushman, new species described below.

ZABRACHYPUS PRIMUS, new species.

Female.— Length 6.5 mm., antennae 4.25 mm., ovipositor 1.0 mm.

Head polished, rather densely pilose; face medially elevated and weakly punctured, about as long as wide; clypeus half as long as wide, arcuately subtruncate, rather weakly convex; malar space barely half as long as basal width of mandible; eyes large, convergent below, sinuate within; diameter of lateral ocellus, postocellar line, and ocell-ocular line equal; temples convexly sloping; antennae stout, tapering slightly toward apex; thorax subpolished, weakly punctate; notauli deep, complete, prescutum rather low; metapleura and propodeum more coarsely and densely punctate, the latter polished medially; stigma narrow, radius in middle; nervulus postfurcal; nervellus perpendicular, strongly broken in middle; first tergite as broad at apex as long, with anterior basin broad and set off by rather strong carinae, with deep oblique apical impressions; following tergites rather densely, finely punctured, elevations transverse, apical tergites subpolished; exserted portion of ovipositor rather longer than first tergite.

Black; palpi white; clypeus, mandibles, and scape below piceous; antennae brown; tegulae yellow; wings faintly brownish; legs mostly testaceous, coxae piceous, those of front and middle legs reddish toward apex; hind tibiae and tarsi fuscous with subbasal annulus on tibia and basal annulus on basitarsus yellowish; apices of front and middle femora, bases of their tibiae, and all trochanters more or less yellow.

Type locality.—Montana.

Type.—Cat. No. 19172, U.S.N.M.

One female without other data.

Tribe **THERONIINI** Cushman and Rohwer.

The genera included in this tribe are *Theronia* Holmgren, *Neotheronia* Krieger, and *Epimecoideus* Ashmead. The first two have heretofore been placed in the (Pimplini) Ichneumonini, while Ashmead's genus was described in the Lissonotini. *Pseudacoenites* Kriechbaumer, synonymous with *Theronia*, was considered by its author to be related to *Acoenites* Gravenhorst, but was placed by Ashmead in the Lissonotini.

The closest relative of the Theroniini among the tribes is probably the Ephialtini, and from that tribe it is easily distinguished by the form of the ovipositor, the slit-like propodeal spiracles with their prominent surrounding carinae, the short, deep, parallel notauli, and the polished, usually light-colored body.

So far as definite information in regard to the host-relations of these insects is at hand, they are apparently secondary parasites through other Ichneumonidae, records of their having been reared from other Ichneumoninae and Ophioninae having been published.

Description.—Entire body almost unsculptured, smooth and polished; head transverse, narrow behind eyes, temples more or less convex; face broader than long, narrowed toward clypeus; eyes large, more or less distinctly emarginate or sinuate opposite antennae; ocelli large; frons slightly concave; malar space very short; clypeus truncate or rounded at apex; antennae long filiform, scape short and strongly oblique at apex, pedicel about as long as scape, basal joint of flagellum nearly twice as long as second, those beyond middle as broad as long; thorax rather short, high anteriorly; notauli short and parallel, deep anteriorly with a ridge running back along the margin of the lateral lobe; prepectus broad, the carina turning sharply toward the promesothoracic suture about half way up the pleura; mesopleural suture angulate opposite the punctiform fovea; scutellum strongly convex, margined only at base; propodeum with at least a very strong apical carina, spiracle long and slit-like, the surrounding carina high; wings large, stigma narrow lanceolate, radius before middle, areolet broadly sessile, nervellus strongly reclivous and broken far above the middle; legs, especially posterior femora, stout, last tarsal joint in hind legs as long as first; abdomen fusiform, rather narrow at base; first tergite longer than broad and longer than second, others transverse, apical tergite short; ovipositor shorter than abdomen, subcylindrical, the lance nearly straight dorsally to apex; hypopygidium retracted.

Generic characters.—The three genera are separable by the structural and color characters used in the following key to genera. These are the only characters of any importance that have been discovered; and of these only two, the propodeal carinae and the infumation of the wing apices, are without exceptions within one or another of the genera as represented in the material examined. Krieger's very long and minute description of *Neotheronia* [1] applies almost equally as well, with these two exceptions, to *Theronia*. Even these two characters are more or less comparative, for some specimens of *Neotheronia* have the propodeum flattened medially with obsolete ridges in the normal positions of the carinae, and the infumation of the wings in that genus varies in intensity, sometimes almost to absence.

KEY TO GENERA.

1. Propodeum before apical carina divided into five areas, the lateral carina sometimes weak; prepectal carina only weakly curved at sternauli, not subangulate where it turns toward the promesothoracic suture, the sternauli weak; wings immaculate, stigma and costa usually red; face more or less elevated in middle, without longitudinal furrows; clypeus usually convex basally and impressed at apex.. *Theronia* Holmgren.

   Propodeum with longitudinal carinae wanting before apical carina; wings more or less infumate at apex, costa blackish, stigma usually so; face usually flat with two more or less distinct longitudinal furrows; clypeus flat, broadly rounded at apex and with a reflexed margin.................................... 2.

2. Prepectal carina as in *Theronia;* first tergite nearly parallel-sided, about four times as long as wide at apex, dorsal carinae obsolete; wings yellow with brilliant gold reflections, stigma except costal margin red; face slightly elevated medially and with very weak furrows......................*Epimecoideus* Ashmead.

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[1] Krieger, R., Zeitschr. Hym. Dip., vol. 5, 1895, p. 289.

Prepectal carina deeply curved at sternauli and usually subangulate where it turns toward promesothoracic suture; first tergite broader with sides divergent, dorsal carinae distinct; wings at most slightly stained, stigma usually blackish; face usually flat with strong furrows, rarely elevated medially and without furrows.. *Neotheronia* Krieger.

Genus THERONIA Holmgren.

Theronia Holmgren, Öfvers. Vet.-Acad. Förh., vol. 16, 1859, p. 123. *Genotype.*—(*Pimpla flavicans* Fabricius) *Ichneumon atalantae* Poda.

Pseudacoenites Kreichbaumer, Ent. Nachr., 1892, p. 219. *Genotype.*—(*Pseuda. coenites moravicus* Kriechbaumer) = *Theronia laevigata* Tschek, according to Krieger, Zeitschr. Hym. Dip., vol. 3, 1902, p. 189–190.

As indicated above the difference between this and the other genera of the Theroniini is comparatively little and largely a matter of difference in degree of development of certain features. The carination of the propodeum and the immaculate wings will apparently, however, always distinguish *Theronia* from the other genera.

In our fauna the genus is represented by but two species. These are very distinct and easily identified by the characters employed in the following key. Both species were originally described in the genus *Pimpla* Gravenhorst.

KEY TO NORTH AMERICAN SPECIES.

Head largely yellow, more or less rufous dorsally and posteriorly; face not tuberculate; weakly punctate; first tergite in profile evenly curved above *fulvescens* (Cresson).

Head black, face strongly punctate and medially tuberculate; first tergite elevated above.. *melanocephala* (Brullé).

THERONIA FULVESCENS (Cresson).

Although a fairly common species and though originally misplaced in the genus *Pimpla*, this species has apparently escaped redescription, and it was not referred to its proper genus until thirty-two years later, when Howard recorded the rearing of a single male as a parasite of *Hemerocampa leucostigma* giving the author as Brullé. This mistake in authorship was not Howard's but Ashmead's, for the specimen on which the record is based is one of the series examined and was determined by Ashmead.

Krieger's variety *americana* of the European *atalantae* (Poda), based on a specimen from British Columbia, is undoubtedly this species; and a male labelled by Viereck with Krieger's name is a normal male of this species. In his latest mention of *fulvescens* Viereck[1] treated it as a variety of *atalantae*.

The present species is perhaps nothing more than a geographical race of *atalantae*, but judging from a comparison of the material at hand with 10 specimens of *atalantae* it differs in having the face slightly longer, the antennae fuscous above, the discocubital vein more or less angulate and sometimes even with a short ramulus, and the ovipositor more than half as long as the abdomen. In *atalantae* the antennae are concolorous above and below, the discocubital vein not at all angulate, and the ovipositor less than half as long as the abdomen.

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[1] Hym. Conn., 1917, p. 323.

Face rounded but not distinctly tuberculate medially, weakly, sparsely punctate; eyes distinctly, though broadly, emarginate opposite antennae; postocellar line and diameter of lateral ocellus subequal; epomia weak; sternauli obsoletely impressed; lateral carinae of propodaum weak basally, the costella not at all developed, the spiracle more than half as long as height of pleural area, its lower end very close to pleural carina, median carinae parallel; discocubital vein sinuate with a more or less distinct angulation in the middle, not strongly curved; hind femur with a distinct scrobe for the reception of the tibia, the scrobe flanked on the outside by a sharp ridge which is either scalloped or entire; first tergite in profile uniformly weakly arched above, but little longer than second.

Head mostly yellow, antennae reddish-brown, paler below, scape and pedicel yellow; thorax bright refescent varied with yellow below and on scutellum, three longitudinal stripes on mesoscutum darker, sometimes more or less brownish, prepectus with a more or less distinct brownish spot on each side, metasterum and thoracic sutures also sometimes brownish; abdomen darker rufescent, sometimes more or less piceous; wings more or less yellow; legs stramineous to pale testaceous, the lighter color on the front and middle coxae and trochanters and base of hind tibia, hind femur at base and apex more or less piceous, apical joint of hind tarsus concolorous with other joints.

This is a very widely distributed species and subject to great variation, especially in size and color of wings, and Viereck has described a variety, *mellipennis*, said to have the face medially finely rugulose and the wings strongly yellowish. The sculpture of the face varies somewhat in the series examined, and several specimens, including one from the same locality as Viereck's type, have very faint, fine rugulosity in the middle; but in the opinion of the writer neither this nor the depth of color of the wings is of even varietal significance. However, since Viereck's type has not been examined the variety *mellipennis* is treated as valid and separable from the typical form by the sculpture of the face as follows:

KEY TO VARIETIES.

Face not or very faintly regulose medially........................*fulvescens* (Cresson).
Face medially rugulose..*mellipennis* Viereck.

THERONIA FULVESCENS FULVESCENS (Cresson).

Pimpla fulvescens CRESSON, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 268, male. *Type.*—No. 1541, Acad. Nat. Sci. Phila.

Theronia fulvescens (BRULLÉ) Howard, Bur. Ent. Tech. Ser. Bull. 5, U. S. Dept. Agr., 1897, p. 24.

Theronia fulvescens (CRESSON) Fiske, Tech. Bull. 6, N. H. Coll. Agr. Expt. Sta., 1903, p. 217.

Theronia atalantae, var. *americana* KRIEGER, Zeitschr. Hym. Dip., vol. 6, 1906, p. 240, male.

Theronia fulvescens (CRESSON) Morley, Rev. Ichn., pt. 3, 1914, p. 40.

Theronia atalantae fulvescens (CRESSON) Viereck, Hym. Conn., 1917, p. 323.

The difference between this and the variety *mellipennis* Viereck has already been discussed.

As indicated above, this species exhibits great variation. In the series examined the females range in length from 7 mm. to 13 mm. and the males from 7 to 15 mm. The color varies from almost stramineous to dark ferruginous, with more or less piceous on the abdomen, and the wing color from almost hyaline to deep yellow. The hind femur in the larger specimens has a high, sharp, scalloped ridge on the outer side of the scrobe, while in the smallest ones this is almost imperceptible and entirely lacks the scalloped edge; between these two extremes the variation is gradual.

The range of this species as represented in the National Museum is from coast to coast and from British Columbia and New Hampshire to New Mexico and District of Columbia. The type is from Colorado, and the types of Krieger's variety are from British Columbia.

Among these specimens are some said to have been reared from such hosts as *Hemerocampa leucostigma* Smith and Abbott, *Oreta rosea* Walker, *Tortrix fumiferana* Clemens, and tussock moth (California). Fiske records it as a secondary parasite on *Malacosoma americana* (Fabricius) through (*Pimpla*) *Itoplectis conquisitor* (Say) and in one case as probably tertiary through *Itoplectis* and (*Limneria*) *Hyposoter fugitivus* (Say). He states that it is externally parasitic. Fiske and Thompson[1] record it in connection with *Callosamia promethea* Drury, ascribing to it both primary and secondary parasitic habits, in the latter case through *Spilocryptus extrematis* (Cresson) and *Ophion macrurum* (Linnaeus). All of their records are based on examination of the cocoons of the host species, and in eighty per cent of all cases *Theronia* was positively proved secondary, while the statement that it was primary in the other cases is based on the fact that no remains of other parasites were found. To the present writer it seems impossible that a parasite can be both internally and externally parasitic. Its external habit was definitely proved by Fiske in his earlier work. Living as a primary parasite of pupae of lepidoptera it would of necessity be internal; and the writer believes that in the cases where Fiske and Thompson thought it to be primary the remains of the true primary were simply not found.

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[1] Journ. Econ. Ent., vol. 2, 1909, p. 455–456.

THERONIA FULVESCENS MELLIPENNIS Viereck.

Theronia fulvescens, variety *mellipennis* VIERECK, Trans. Amer. Ent. Soc., vol. 29, 1903, p. 87, female. *Type.*—Acad Nat. Sci. Phila.

This variety has already been discussed. It is based on a single female from Beulah, New Mexico.

THERONIA MELANOCEPHALA (Brullé).

Pimpla melanocephala BRULLÉ, Hist. Nat. Ins., Hym., vol. 4, 1846, p. 99, female.
Pimpla melanocephala Brullé, WALSH, Trans. St. Louis Acad. Sci., vol. 3, 1873, p. 131.
Theronia melanocephala (BRULLÉ) Cresson, Trans. St. Louis Acad. Sci., vol. 3, 1873, p. 132, note.

Discussion based on fifteen females and twelve males, all in the National Museum.

Differs from *fulvescens* as follows: Face medially tuberculate and strongly, densely punctate; eyes merely sinuate opposite antennae; postocellar line distinctly longer than lateral ocellus; epomia strong; sternauli wanting; lateral carinae of propodeum strong throughout, costella developed below, spiracle barely half as long as height of pleural area, its lower end distinctly removed from pleural carina, median carinae convergent basally; discocubital vein strongly curved, not at all angulate in middle; hind femur with at most an obsolete scrobe; first tergite in profile subangulate above, much longer than second. Head black, facial tubercle, clypeus, and mandibles more or less reddish-brown; color otherwise much as in *fulvescens* but generally darker, except abdomen, the yellow nearly absent and the piceous color if present on the thorax usually confined to the sides of the pronotum; apical joint of hind tarsus blackish.

In color this species is somewhat less variable than is *fulvescens*, but the variation in size is practically the same, females examined measuring from 7 to 13 mm. and males from 7 to 12 mm. in length.

The National Museum series includes specimens from Massachusetts, New York, Indiana, West Virginia, Maryland, and Virginia, while Provancher had it from Canada.

There are no biological records associated with any of the specimens examined, but it has been recorded as reared from *Porthetria dispar* (Linnaeus), *Malacosoma americana* (Fabricius), and *Halisidota maculata* Harris, in the second case associated with (*Pimpla*) *Ephialtes pedalis* (Cresson).

Genus EPIMECOIDEUS Ashmead.

Epimecoideus ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 52. *Genotype.*—*Epimecoideus apicalis* Ashmead, not described specifically.

This genus does not occur in North America, and is discussed here only to call attention to its proper position. Ashmead included it in his key to the Lissonotini. It is, however, closely allied to *Neotheronia* Krieger, so closely that it is doubtful if it is really generically distinct. Krieger[1] apparently included two allied species in *Neotheronia,* his *aurata* and *micans.* Ashmead's species is very likely synonymous with *micans,* but the tips of both front wings of the only specimen are missing and it is impossible to state whether or not it possessed the darker spot in the apex of the radial cell. Otherwise it agrees perfectly with the description of *micans.* It is from Ecuador, as is also Krieger's species.

(NEOTHERONIA) EPIMECOIDEUS AURATUS (Krieger).

(NEOTHERONIA) EPIMECOIDEUS MICANS (Krieger).

Genus NEOTHERONIA Krieger.

Neotheronia KRIEGER, Sitz. naturf. Ges. Leipzig, 1898, p. 119. *Genotype.*—*Theronia tolteca* Cresson.

The lack of all longitudinal carinae on the propodeum in front of the apical carina and the maculation of the wings serve to distinguish this genus from *Theronia.* To distinguish it from *Epimecoideus* only the characters used in the key, all of doubtful generic value, have been discovered.

Very largely neotropical in its range, whence Krieger[2] lists upward of 50 species, this genus is represented in North America by but two species, *septemtrionalis* Krieger and *winnamanae* Viereck. These two appear to be very likely synonymous, but using Krieger's key and Viereck's types as a basis for comparison the following differences are noted:

KEY TO NORTH AMERICAN SPECIES.

Prepectal carina strong above; face at clypeus less than four-fifths as broad as vertex; first tergite with a dark band across middle.............. *winnamanae* Viereck.

Prepectal carina weak above; face at clypeus four-fifths as broad as vertex; first tergite without a dark band................................ *septemtrionalis* Krieger.

NEOTHERONIA WINNAMANAE Viereck.

Neotheronia winnamanae VIERECK, Proc. U. S. Nat. Mus., vol. 44, 1913, p. 567, female. *Type.*—Cat. No. 15297, U.S.N.M.

Viereck separated this species from *septemtrionalis* Krieger by the difference in the number of antennal joints, the extent of the infumation of the wings, the presence of a dark band on the first tergite, and the black apical joint of the hind tarsus. There are in the United States National Museum, including Viereck's two types, ten specimens, four females and six males, which are without doubt conspecific. These show variation in the number of flagellar joints from 41 to 47, the number varying directly with size. The infumation of the wings is not as Viereck described it, but is perfectly normal for the genus, being faint entirely across the tip of the wing with a darker spot embracing the apex of the radial and upper outer corner of the third cubital cells. Krieger, by inference only, says that his species lacks the dark band on the first tergite; *winnamanae* has it, but in the series of specimens it varies from broad and distinct to nearly absent. In regard to the color of the apical joint of the hind tarsus in *septemtrionalis* Krieger says nothing.

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[1] Zeitschr. Hym. Dip., Heft 5, 1905, p. 289.

[2] Idem, Heft 5, 1905, pp. 286-307, 333-338.

The three characters used in the above key all show variation in the series examined, the width of the face and of the vertex being in the proportion of form 1:1.23 to 1:1.4.

In addition to the type females the National Collection contains another female from the type locality, Plummers Island, Maryland, September 29, 1912, P. R. Myers; one male, Cabin John, Maryland, June 25, 1917, E. L. Fouts; four males collected in Alabama by H. H. Smith, three at Pyziton, Clay County, and the other at Coleta; one female, Tallulah, Louisiana, V. I. Safro; and one male without locality.

NEOTHERONIA SEPTEMTRIONALIS Krieger.

Neotheronia septemtrionalis KRIEGER, Zeitschr. Hym. Dip., vol. 5, 1905, p. 305, male.

The differences between this species and *winnamanae* Viereck have already been discussed under the latter species and need not be repeated.

Krieger's material was from North Carolina.

HOST LIST.

ARACHNIDA.

Dictyna volupis.

Polysphincta (*Zatypota*) *dictynae* Howard.

Epeira sclopetaria.

Polysphincta (*Polysphincta*) *koebelei* Howard (?).

Epeira strix.

Polysphincta (*Polysphincta*) *koebelei* Howard (?).
Polysphincta (*Polysphincta*) *strigis* Howard.

Epeira trivittata.

Hymenoepimecis wiltii (Cresson).

Linyphia obscura.

Acrodactyla madida (Haliday).

Steatoda borealis.

Polysphincta (*Polysphincta*) *texana* Cresson.

Tetragnathus, species.

Colpomeria kincaidii (Ashmead).

Theridium, species.

Polysphincta (*Zatypota*) *theridii* Howard.

HYMENOPTERA.

(*Pimpla*) *Ephialtes pedalis* (Cresson).

Theronia melanocephala (Brullé).

(*Limneria*) *Hyposoter fugitivus* (Say).

Theronia fulvescens fulvescens (Cresson).

(*Pimpla*) *Itoplectis conquisitor* (Say).

Theronia fulvescens fulvescens (Cresson).

Ophion macrurum (Linnaeus).

Theronia fulvescens fulvescens (Cresson).

Spilocryptus extrematis (Cresson).

Theronia fulvescens fulvescens (Cresson).

LEPIDOPTERA.

Callosamia promethea Drury.

Theronia fulvescens fulvescens (Cresson). Primary and secondary.

Canarsia hammondi Riley.

Chlorolycorina albomarginata (Cresson).

Halisidota maculata Harris.

Theronia melanocephala (Brullé).

Hemerocampa leucostigma Smith and Abbott.

Theronia fulvescens fulvescens (Cresson).

Malcosoma americana (Fabricius).

Theronia fulvescens fulvescens (Cresson). Secondary.
Theronia melanocephala (Brullé).

Oreta rosea Walker.

Theronia fulvescens fulvescens (Cresson).

Porthetria dispar (Linnaeus).
Theronia melanocephala (Brullé).

Tetralopha subcanalis Walker.
Chlorolycorina scitula (Cresson).

Tortricid on oak.
Toxophoroides xanthozonata (Ashmead).

Tortrix fumiferana Clemens.
Theronia fulvescens fulvescens (Cresson).

Tussock moth (California).
Theronia fulvescens fulvescens (Cresson).

Ypsolophus bipunctellus Walsingham.
Chlorolycorina albomarginata (Cresson).

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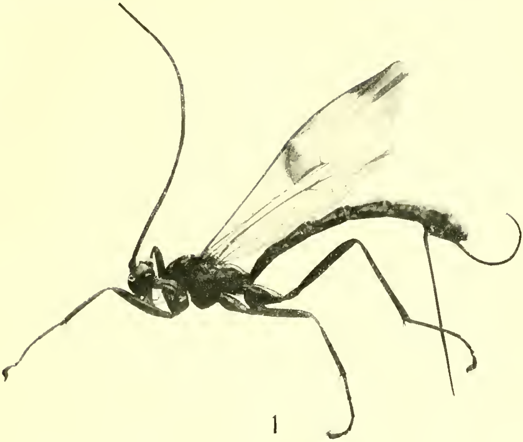

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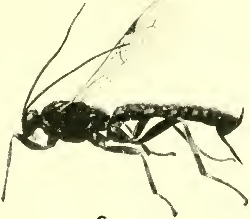

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1. Hymenoepimecis wiltii (Cresson) Female; 2. Polysphincta texana (Cresson) Female.

For explanation of plate see page 16.

A CLASSIFICATION OF THE AMERICAN OPERCULATE LAND MOLLUSKS OF THE FAMILY ANNULARIIDAE.

By John B. Henderson and Paul Bartsch,

Of the Section of Mollusks, United States National Museum.

INTRODUCTION.

This new classification of the American "Cyclostomidae" is the outcome of the critical study of an almost complete collection of the known species comprising that large and diversified assemblage of operculate land-snails. Opercular characters have been employed for all the larger groupings, that is, the subfamilies and genera. The comparatively few species, the opercula of which we have not actually seen, are excluded from consideration. We soon found that assumptions as to generic position of a species based upon similarity of shell characters were too often misleading. To the total of the species involved the proportion of those of which our specimens lacked opercula, while not negligible, is yet not sufficiently great materially to weaken our conclusions, nor likely, when their opercula may eventually be known, to call for any serious modification of our scheme of classification.

The new arrangement here offered calls, first, for a separation of all the American forms from the Old World groups with which they have been associated. This is accomplished by the creation of a new family, the Annulariidae, founded upon a constant and essential radular difference, the details of which are discussed under the description of the new family.

The second step has been the creation under the Annulariidae of four chief groups designated as subfamilies. These subfamilies are based wholly upon characters presented by the operculum—characters which have been accepted as basic and of primary importance. The natural order or sequence of these subfamilies has been determined by what we conceive to be progressive opercular changes through various gradations from the simplest or most primitive form to the most complicated or specialized types. These changes appear to proceed by easy gradations and with but slight interruption through continuous lines of development.

The third step has called for the proper disposition of the existing genera and for the creation of a few new genera. These are based almost wholly upon minor modifications of the opercular characters, and, in some instances, upon certain distinguishing shell characters but only where such consideration does no violence to the more important opercular evidences.

To further refine the classification we have created a generous number of subgenera based almost wholly upon shell characters, using especially the "breathing apparatus" and the sculptural features in their various combinations. A final division under the subgenera carrying the classification to its ultimate rational end has been adopted by designating specific groupings wherever obvious similarity in form has made such assemblages useful for systematic study.

Among the numerous shell characters employed in our classification we have considered the most important the presence or absence of punctures or slits within or on the edge of the aperture, and when present, the nature of such devices for enabling the animal to obtain air when the operculum is withdrawn or seals the aperture. This character we believe to be of less taxonomic value than that of the opercula but of paramount importance among the shell characters.

Among the Annulariidae we have found no important radular differences and no range in nuclear characters worthy of note. A sufficiently large number of species from the different genera have already been described anatomically, or observed by ourselves, to warrant our belief that no fundamental anatomical differences exist within the scope of the entire family. The length of the proboscis seems to be merely relative. The division of the foot by a longitudinal groove into two independently functioning muscular masses is always present, but the peculiar method of progression caused thereby is merely exaggerated in those species where the foot is short and less apparent when the foot is longer.

OPERCULUM.

The outer periphery of the opercular whorls usually tapers to a very thin edge, which becomes upturned as the operculum is drawn into the aperture to close the shell. This upturning of the free edge is the introduction of the lamellar formation which we find so wonderfully diversified in this family. Even in Chondropoma, which was originally defined as a simple chondroid plate, we find that these outer upturned edges are not always cemented down flat upon the upper surface of the succeeding turn, but at times are left as a suggestion of a slender lamella, though more often they are worn away, leaving only an indication of a sutural thread. From this we can easily develop the Adamsiellinae, in which the inner edge of the whorl backs up and strengthens the slight chondroid upturned outer edge of the preceding turn until a strong, simple, elevated, calcified lamella is formed. In the Annularinae this process is carried a step further and instead of a mere simple more or less erect spiral lamella, we have the calcified lamella variously strengthened by calcified riblets, or in extreme cases connected by trabeculae with the calcareous deposit on the basal plate. This is particularly true in such forms as have the lamella reflected outward to parallel the basal plate. In all the Annularinae the operculum has a double appearance, the outer and inner plate being separated by a concave groove at the free border. In some Annularinid mollusks the lamellae completely cover the space between succeeding turns, and did one not remove the operculum from the shell one would be left in doubt as to whether the operculum was simple or double.

The amount of calcification and the manner in which this takes place is also interesting and points out another line of progressive modification. In the Chondropominae we may find a few scattered calcareous granules, or enough of these to form a material thickening, but no matter what the amount, it is never built into ribs or lamellae. In the Rhytidopominae, on the other hand, we find in the simplest forms slender retractively placed riblets which radiate from the inner edge of the whorls outward across either a part or the whole whorl. In other members of the subfamily, these weak riblets are replaced by strong ribs which may fuse to form a spiral lamella at their inner, or outer, or both borders, but in no instance have we found the inner lamellae thus formed arch outwardly to form a plate, as is the case in the Annularinae, though in the Rhytidopomid genus *Xenopoma*, the outer lamella is extraordinarily developed and arches inwardly over the preceding turns, completely covering them.

BREATHING DEVICES.

The breathing devices found in Annulariidae are very ingenious. They range from a mere notch in the peripheral callus near the posterior angle of the aperture, which leaves a slender opening when the operculum is withdrawn, to a puncture in the parietal wall, which may or may not be provided with a projecting tube (siphon) on the outside. Some have a puncture in the parietal wall connected with the outer surface of the peristome by a slit. In some the puncture connects with an air chamber which passes back for several turns in the parietal wall and which is in communication with the hollow axis by a series of minute punctures. In some forms the puncture communicates directly with the hollow axis of the shell. The umbilicus being sealed by the parietal callus, the animal breathes through the perforation at the truncated apex. This apex breathing when the operculum is closed reaches its highest development in *Rhythidopoma,* in which the siphon bends down through the solute portion of the last turn over the base of the preceding turn into the umbilicus, completely plugging it, breathing being effected through the axial puncture at the decollated apex.

Interesting as these characters are, they must be considered as of secondary systematic importance to those of the operculum. The latter develops its characteristics at an early stage of the mollusk's history, while the breathing device, with the exception of *Rhytidothyra bilabiatum* Orbigny, is developed near the final stage of the shell growth. Then, too, we find quite similar devices in the family Cyclophoridae, all of which strengthens the position of the opercular features as prime factors in phylogenetic classification, which is also more in harmony with the sum total of the characters presented by the shell.

CHRONOLOGICAL REVIEW OF THE SUPERSPECIFIC NOMENCLATURE OF THE ANNULARIIDEA.

nnaeus, Müller, Lamarck, Wood, and other early authors who described the first species of this family, employed the generic names of *Turbo*, *Nerita*, *Truncatella*, and finally *Cyclostoma*. This latter name proposed by Draparnaud in 1801, in his Tableau de Mollusques, had been unfortunately used by Lamarck for a marine mollusk. "*Cyclostoma*" was nevertheless indiscriminately used for a century by many authors in describing a host of species, both from the New and the Old World. This use continued even after the adoption of a number of genera created especially for various groups of American species. C. B. Adams, Poey, Orbigny, Morelet, and Gould may be cited among others who preferred "*Cyclostoma*" to the newer titles. The name was later expanded to family rank as the "Cyclostomatidae" or "Cyclostomacea" and as such has included both European and American forms save those that in 1885 were removed by Crosse to constitute a separate family—the Cyclophoridae.

The following is a chronological list of the genera heretofore founded upon New World species:

1797. *Cistula* (Humphreys) Museum Calonianum, p. 62. By reason of the opinion of the International Commission on Nomenclature as set forth in Smithsonian Publication No. 2060, in February, 1912, this work is excluded from scientific nomenclature, hence the name of *Cistula* as therein proposed can not be considered.

1801. *Cyclostoma* Drapernaud, Tab. Moll. France, p. 37, and later exemplified in his Hist. Nat. Moll. France (1805), pp. 25, 74. The name was preoccupied by Lamarck in 1779, having been applied by him to a marine mollusk.

1810. *Cyclostomus* Montfort, Conch. Syst., p. 287. Type, *Cyclostomus elegans* Müller, of southern Europe.

1817. *Annularia* Schumacher, Essai Nouv. Syst. Hab. Vers Test., pp. 60, 169. This name was wrongfully invalidated by Herrmannsen in 1846 for that it was preoccupied in fossil plants. It was restored by Dall, Proc. Malac. Soc. London, vol. 1, p. 209 (1905), who selected *Turbo lincina* Linnaeus as its type.

1847. *Choanopoma* Pfeiffer, Zeitschr. Malak., vol. 4, p. 47. The four species cited by Pfeiffer without designating a type are all *Annularia* s. s. The genus therefore is an absolute synonym of *Annularia*.

1847. *Cistula* Gray, Proc. Zool. Soc. London, p. 181. This name was taken from the Museum Calonianum (Humphreys). Gray's genus, however, falls by reason of priority of Say's genus *Cistula*, 1825 (Reptilia).

1850. *Tudora* Gray, Brit. Mus. Cat. Cycloph., p. 48. Type, *Tudora similis* Gray, which is a synonym of *Cyclostoma megacheilos* Potiez and Michaud, which therefore becomes the type.

1850. *Jamaicia* C. B. Adams, Contr. Conch., p. 88. Type, *Cyclostoma anomalum* C. B. Adams.

1850. *Licina* Gray, Brit. Mus. Cat. Cycloph., p. 60. Type, *Nerita labeo* Müller. Gray took this name from Brown's work on Jamaica, 1756. The type must be selected from one of the two species cited by Gray of neither of which the operculum is known. We are therefore unable to assign the genus to any fixed position in our scheme of classification.

1851. *Adamsiella* Pfeiffer, Zeitschr. Malak., p. 155. Type, *Turbo mirabilis* Wood, selected by Dall, 1905.

1856. *Ctenopoma* (Shuttleworth) Pfeiffer, Malak. Blät., vol. 3, p. 58. Type, *Cyclostoma rugulosum* Pfeiffer. As shown by Sykes 1901 (Journ. Malac., vol. 8, p. 59) Pfeiffer's name is preoccupied by *Ctenopoma* Peters, 1844, for a genus of fishes. He renamed it *Rhytidopoma*.

1859. *Diplopoma* Pfeiffer, Malac. Blät., vol. 6, p. 73. Type, *Diplopoma architectonicum* Gundlach.

1888. *Colobostylus* Crosse and Fischer, Journ. Conchyl., vol. 36, p. 229. Type, *Cyclostoma jayanum* C. B. Adams, selected by Dall, 1905.

1890. *Blaesospira* Crosse, Journ. Conchyl., vol. 38, p. 280. Type, *Cyclostoma echinus* Wright.

1890. *Xenopoma* Crosse, Journ. Conchyl., vol. 38, p. 282. Type, *Choanopoma hystrix* Wright.

1901. *Rhytidopoma* Sykes, Journ. Malac., vol. 8, p. 60. Sykes proposed this name to replace *Ctenopoma* Pfeiffer, 1856 (not *Ctenopoma* Peters, 1844).

1905. *Parachondria* Dall, Proc. Malac. Soc. London, vol. 6, p. 209. Type, *Turbo fascia* Wood.

1905. *Opisthosiphon* Dall, Proc. Malac. Soc. London, vol. 6, p. 209. Type, *Cyclostoma bahamense* Shuttleworth.

1913. *Ramsdenia* Preston, Proc. Malac. Soc. London, vol. 10, p. 323. Type, *Ramsdenia mirifica* Preston.

ANNULARIIDAE, new family.

This family includes all the New World "Cyclostomoid" mollusks placed under the family name of Cyclostomatidae or Ericiidae.

The chief distinguishing character which separates this group from all other operculate pulmonates is found in the radula which fundamentally is uniform throughout the large number of species, which are included. The radula possesses a unicuspid rachidian tooth; a single unicuspid lateral tooth, and two marginals—the inner one resembling in form the lateral tooth but multicuspid—and an outer one which is long and curved like a bow and is pectinated both upon its recurved edge and upon its main portion, but is not thereby separated by the pectinations into a group of individual teeth. There is no jaw. The sole of the foot is longitudinally divided by a sulcus which separates it into two muscular masses functioning independently one of the other, and thus giving to the animal a method of progression by alternate waves of muscular contraction, first on one side and then on the other. The foot is relatively short. A bifid muzzle of varying length is always present. The tentacles are long, slender, and fibrillar or slightly swollen at the ends. The eyes are placed at the base of the tentacles on the outer side and often raised above the surface of the head by a fleshy protuberance.

The operculum shows a wide degree of variation through the various divisions of the family but follows, nevertheless, distinct lines of progression from a simple type to a very complicated structure, the steps from one extreme to the other being easily traceable. All the opercula possess a basal chondroid plate upon which calcareous ribs and lamellae are placed, the modifications of which are used in subdividing the family into a series of subfamilies, and genera, as will be set forth below.

The shell varies in shape from depressed helicoid to elongate conic. The sculpture varies from axially ribbed only to axially ribbed and spirally lirate, the intensity of these sculptural elements varying from obsolete to lamellose.

Type genus.—*Annularia* Schumacher.

The Annulariidae differs from the Ericiidae, an Old World group, in the radula. The Ericiidae possess multicuspid rachidian, lateral, and inner marginal teeth. The outer marginal is pectinated, but the pectinations are confined to the reflected portion of the tooth. In the Annulariidae, on the other hand, the rachidian and lateral teeth are always unicuspid, the inner marginal is multicuspid, and the outer marginal is pectinate, but the pectinations extend beyond the reflected portion, involving the main blade.

These radular differences have long since been cited by authors. There is an error on the part of Troschel (Das Gebiss der Schnecken, vol. 1, p. 75, pl. 5, fig. 1) in describing and figuring a New World species, *Cistula candeana* d'Orbigny, or sometimes believed to have been *Cistula illustris* Poey, with a radula possessing a multicuspid rachidian and lateral tooth, or in other words, a typical Old World Erycid radula. The uniformly high order of Troschel's work caused this unfortunate error to be generally accepted without verifications; hence authors have hesitated to separate the American from the Old World forms, believing that the radular differences in the American forms showed a range of variation embracing the characteristics of the Old World group and those of the family now defined. We have examined the radula of both *Cistula candeana* and of *Cistula illustris* and have found them to be typically Annularid. An examination of the radula of many species, including all the groups discussed in this paper, has shown no variation in the Annularid characters; that is, unicuspid rachidian and lateral teeth, though minor variations do exist in the marginals.

The geographic range of the Annulariidae extends from the Bahamas and lower Florida on the north, throughout the Greater and Lesser Antilles, and on the mainland from Mexico to Bolivia. By far the greatest development is centered in the Greater Antilles.

KEY TO THE SUBFAMILY, GENERA, SUBGENERA, AND GROUPS OF THE FAMILY ANNULARIIDAE.

- A^1. Lamellae absent or obsolete on the operculum.
  - B^1. Basal plate without ribletlike reenforcement.....Subfamily CHONDROPOMINAE.
    - C^1. Breathing slit or pore absent ....Genus *Chondropoma*.
      - D^1. Spiral sculpture confined to the umbilicus.
        - E^1. Shell turbinate ....Subgenus *Chondropomatus*.
        - E^2. Shell not turbinate ....Subgenus *Chondropomium*.
          - F^1. Shell ovate-conic.
            - G^1. Axial riblets low-rounded ....Group *weinlandi*.
            - G^2. Axial riblets sublamellar ....Group *ambiguum*.
          - F^2. Shell not ovate-conic.
            - Shell elongate-conic.......................... Group *lindenianum*.
      - D^2. Spiral sculpture not confined to the umbilicus.
        - E^1. Shell turbinate ....Subgenus *Chondropometes*.
        - E^2. Shell not turbinate.
          - F^1. Intersections of axial and spiral threads forming sharp cusps.......... Subgenus *Chondropomartes*.
          - F^2. Intersections of axial and spiral threads not forming sharp cusps.
            - G^1. Axial riblets developed into tufts at the summit.................... Subgenus *Chondropomorus*.
              - H^1. Axial riblets not rendered articulate by the spiral sculpture..... Group *dentatum*.
              - H^2. Axial riblets rendered articulate by the spiral sculpture......... Group *santacruzense*.
            - G^2. Axial riblets not developed into tufts at the summit............... Subgenus *Chondropoma*.
              - H^1. Axial riblets stronger than the spiral sculpture....Group *raveni*.
              - H^2. Axial riblets not stronger than the spiral sculpture.

I^1. Axial and spiral threads subequal.
J^1. Shell ovate, peristome not expanded ....Group *semilabre.*
J^2. Shell not ovate, peristome expanded..........Group *irradians.*
I^2. Axial and spiral threads not subequal.
J. Spiral threads stronger than the axial riblets.
K^1. Shell thin, translucent with interrupted color bands....... Group *pictum.*
K^2. Shell solid opaque without color bands......Group *obesum.*
C^2. Breathing slit or pore present.........................Genus *Chondrothyra.*
D^1. Breathing pore connected with the edge of the parietal wall by a slit Subgenus *Chondrothyrium.*
D^2. Breathing pore not connected with the edge of the parietal wall by a slit.
E^1. Shell turbinate, spiral scupture absent except in the umbilicus Subgenus *Chondrothyroma.*
E^2. Shell not turbinate, spiral sculpture present everywhere.
F^1. Peristome continuous in one plane.............Subgenus *Chondrothyra.*
G^1. Shell ovate conic...................................Group *egregium.*
G^2. Shell elongate conic..........................Group *canaliculata.*
F^2. Peristome not continuous in one plane......Subgenus *Chondrothyretes.*
G^1. Shell ovate-conic............................Group *shuttleworthi.*
G^2. Shell elongate conic..............................Group *sinuosa.*
B^2. Basal plate with ribletlike re-enforcements.......Subfamily RHYTIDOPOMINAE.
C^1. Calcareous deposit covering the full width of the whorls. Genus *Rhytidothyra.*
C^2. Calcareous deposit not covering the full width of the whorls.
D^1. Calcareous deposits covering only a portion of the width of each whorl.
E^1. Outer edge of the ribs fused to form a weak lamella.
F^1. Shell without breathing siphon...................Genus *Parachondria.*
G^1. Spiral sculpture absent..................Subgenus *Parachondrisca.*
G^2. Spiral sculpture not absent.
H^1. Spiral sculpture confined to umbilicus...Subgenus *Parachondrella.*
H^2. Spiral sculpture not confined to umbilicus.
I^1. Spiral sculpture strong not giving an articulate appearance to the axial ribs.........................Subgenus *Parachondria.*
J^1. Peristome expanded..........................Group *fascia.*
J^2. Peristome not expanded....................Group *dentilobata.*
I^2. Spiral sculpture not strong, giving an articulate appearance to the axial ribs.........................Subgenus *Parachondrops.*
F^2. Shell with breathing siphon...................Genus *Opisthosiphon.*
G^1. Spiral sculpture confined to the umbilicus. Subgenus *Opisthosiphona.*
H^1. Shell turbinate...................................Group *dalli.*
H^2. Shell not turbinate.
I. Shell conic....................................Group *moreletiana.*
G^2. Spiral sculpture not confined to the umbilicus. Subgenus *Opisthosiphon.*
E^2. Outer edge of ribs fused to form a strong lamella.
F^1. Riblets joining the outer and inner lamella, not as high as the lamella.
G^1. Outer lamella in adult shells reflected inward over the whorls. Genus *Xenopoma.*
G^2. Outer lamella in adult shells not reflected inward over the whorls. Genus *Rhytidopoma.*
F^2. Riblets joining the outer and inner lamella as high as the lamellae. Genus *Torrella.*
G^1. Breathing siphon reflected into and closing the umbilicus. Subgenus *Torrella.*

- G^2. Breathing siphon not reflected into nor closing the umbilicus. Subgenus *Torrellisca.*
- A^2. Lamellae not absent or obsolete on the operculum.
  - B^1. Lamellae not reenforced by strong calcifications . . . Subfamily ADAMSIELLINÆ.
    - C^1. Axial and spiral sculpture about equal.. . . . . Subgenus *Adamsiella.*
      - D^1. Peristome almost or quite adnate to the last whorl.
        - E^1. Axial riblets gathered into tufts at the summit . . . . Group *mirabilis.*
        - E^2. Axial riblets not gathered into tufts at the summit. . . . . . Group *pulchrior.*
      - D^2. Peristome not almost or quite adnate to the last whorl.
        - E. Last whorl decidedly solute. . . . . Group *monstrosa.*
    - C^2. Axial and spiral sculpture not equal.
      - D^1. Axial sculpture much stronger than the spiral . . . . . Subgenus *Adamsiellops.*
        - E^1. Axial riblets gathered into tufts at the summit. . . . . Group *antiguense.*
        - E^2. Axial riblets not gathered into tufts at the summit . . . . . Group *ignilabre.*
  - B^2. Lamellae reenforced by strong calcifications. . . . . Subfamily ANNULARINAE.
    - C^1. Lamellae placed obliquely upon the basal plate . . . . Genus *Annularia.*
      - D^1. Puncture or slit absent.
        - E^1. Spiral sculpture absent. . . . . Subgenus *Annularisca.*
        - E^2. Spiral sculpture not absent.
          - F^1. Spiral sculpture confined to the umbilicus . . . . . Subgenus *Annularosa.*
          - F^2. Spiral sculpture not confined to the umbilicus.
            - G^1. Axial sculpture consisting of almost uniform riblets.
              - H^1. Peristome broadly expanded, thin . . . . Subgenus *Annularia.*
                - I^1. Shell turbinate. . . . . Group *fimbriatula.*
                - I^2. Shell not turbinate.
                  - J^1. Shell ovate-conic. . . . . Group *lincina.*
                  - J^2. Shell not ovate-conic.
                    - K. Shell elongate-conic.
                      - L^1. Spiral sculpture strong. . . . . Group *illustris.*
                      - L^2. Spiral sculpture weak. . . . . Group *lachneri.*
              - H^2. Peristome not broadly expanded.
                - I. Peristome thickened . . . . Subgenus *Annularita.*
            - G^2. Axial sculpture not consisting of almost uniform riblets.
              - H. Axial sculpture consisting of slender lamellae with fine axial threads between them . . . . Subgenus *Annularella.*
                - I^1. Shell turbinate. . . . . Group *yunquensis.*
                - I^2. Shell ovate-conic. . . . . Group *bertini.*
      - D^2. Puncture or slit present.
        - E^1. Puncture without external siphon, axial ribs articulate Subgenus *Annularops.*
        - E^2. Puncture with external siphon, axial ribs not articulate. . . . . Subgenus *Annularodes.*
    - C^2. Lamellae not placed obliquely upon the basal plate.
      - D^1. Lamellae placed vertically upon the basal plate. . . . . Genus *Blaesospira.*
        - E^1. Shell ovate-conic.
          - F^1. All whorls solute. . . . . Group *echinus.*
          - F^2. All whorls not solute. . . . . Group *pretrei.*
        - E^2. Shell not ovate-conic.
          - F. Shell depressed helicoid . . . . Genus *Abbottella.*
      - D^2. Lamellae not placed vertically upon the basal plate.
        - E^1. Lamellae reflected to parallel the basal plate. . . . . Genus *Tudora.*
          - F^1. Lamellae marked by feeble oblique riblets.
            - G^1. Lamellae almost flat.
              - H^1. Breathing notch, slit, or pore absent.

I^1. Shell helicoid.........................Subgenus *Tudorellata*.
J^1. Umbilicus bounded by a spiral cord.......Group *interstitialis*.
J^2. Umbilicus not bounded by a spiral cord...Group *auricomum*.
I^2. Shell not helicoid.
J^1. Shell elongate-ovate—elongate-conic.
K^1. Spiral sculpture absent.............Subgenus *Colobostylus*.
K^2. Spiral sculpture not absent.
L^1. Spiral sculpture confined to the umbilicus............. Subgenus *Tudorisca*.
M^1. Shell elongate-ovate.....................Group *albus*.
M^2. Shell not elongate-ovate.
N. Shell elongate-conic...............Group *chiapensis*.
L^2. Spiral sculpture not confined to the umbilicus.
M^1. Axial ribs not rendered articulated by the spiral sculpture........................Subgenus *Tudora*.
N^1. Riblets tufted at the summit.
O^1. Shell elongate-ovate...........Group *rangelinum*.
O^2. Shell not elongate-ovate.
P. Shell elongate-conic................Group *abbotti*.
N^2. Riblets not tufted at the summit.
O^1. Suture channeled...................Group *habichi*.
O^2. Suture not channeled...........Group *megacheila*.
M^2. Axial ribs rendered articulated by the spiral sculpture Subgenus *Tudorops*.
N^1. Shell ovate-conic.
O^1. Axial ribs gathered into tufts at the summit. Group *banksiana*.
O^2. Axial ribs not gathered into tufts at the summit. Group *xanthostoma*.
N^2. Shell elongate-conic.................Group *undosum*.
H^2. Breathing notch, slit, pore, or siphon present....Genus *Eutudora*.
I^1. Axial sculpture almost obsolete.
J^1. Breathing notch present................Subgenus *Eutudorisca*.
J^2. Breathing notch not present.
K^1. Breathing slit present...............Subgenus *Eutudorella*.
K^2. Breathing slit not present.
L^1. Breathing pore present..............Subgenus *Eutudora*.
I^2. Axial sculpture not almost obsolete.
J. Axial sculpture sublamellar............Subgenus *Eutudorops*.
K^1. Breathing pore without external siphon..Group *azucarensis*.
K^2. Breathing pore with external siphon.....Group *torquatum*.
G^2. Lamellae not flat.
H. Lamellae convex............................Genus *Ramsdenia*.
F^2. Lamellae not marked by feeble oblique riblets.
G. Lamellae marked by strong oblique riblets.......Genus *Diplopoma*.
H^1. Outer surface of operculum not convex in the center............ Subgenus *Diplopoma*.
I^1. Shell ovate-conic...........................Group *retrorsuum*.
I^2. Shell not ovate-conic.
J. Shell elongate-conic...................Group *architectonicum*.
H^2. Outer surface of operculum convex in the center............... Subgenus *Jamaicia*.

CHONDROPOMINAE, new subfamily.

Shell ranging in form from turbinate to elongate-conic. The axial sculpture may consist of strong ribs, or range from those to slender, almost lamellar riblets, or it may be decidedly reduced. There is also a wide range of strength in the development of the spiral sculpture, which may be confined to the umbilicus or may cover the entire shell. Breathing devices are present in some groups and absent in others. The chief character of the subfamily, however, resides in the operculum, which consists of a thin, simple chondroid basal plate of several whorls, the outer edge of which may be faintly upturned to form a very fragile, low, slender lamella, suggesting the starting point of the Adamsiellinae. This is, however, usually soon brushed away, leaving the operculum as a plain plate. The operculum has a deposit of fine calcareous granules which may be very slight or fairly strong, depending upon the species in question.

Type genus.—Chondropoma.

Genus CHONDROPOMA Pfeiffer.

1847. *Chondropoma* Pfeiffer, Zeitschr. Malak., vol. 6, p. 109.

Shell ranging in form from turbinate to elongate-conic; the sculpture in varying intensity may consist of axial ribs only or of axial ribs and finer axial threads or of axial ribs and spiral threads. All, even those without spiral sculpture on spire and base, have spiral threads on the umbilical wall. No special breathing device is developed in the members of this genus. The operculum is simple; that is, it consists of a chondroid plate made up of a varying number of whorls, the outer thin edges of which are sometimes faintly upturned to form a suggestion of an obsolete lamella. The outer surface of the operculum has a deposit of calcareous granules which is usually very slight, but in some species rather pronounced. In no instance is this entirely absent. The position of the opercular nucleus, whether excentric or subcentral, depends upon the shape of the aperture.

Type of the genus.—Cyclostoma semilabre Lamarck. Selected by Dall in 1905.

CHONDROPOMATUS, new subgenus.

Shell of turbinate form, marked by strong axial ribs, between which finer threads parallel to the ribs are present. The axial sculpture extends into the open umbilicus, the wall of which is marked by strong spiral cords. Operculum typically Chondropomoid.

Type of the subgenus.—Chondropoma latum (Gundlach) Pfeiffer.

The type species is the only one known of this group at present. It comes from eastern Cuba.

CHONDROPOMIUM, new subgenus.

Shell varying in shape from ovate to elongate-conic, marked by axial ribs on spire and base. Spiral sculpture absent except on the umbilical wall, where spiral cords are present. Operculum typically Chondropomoid.

Type of the subgenus.—*Chondropoma weinlandi* Pfeiffer.

The following species are now referred to this subgenus. They fall easily into three groups as follows:

The group of *Chondropomium weinlandi:*

Cyclostoma weinlandi Pfeiffer	Haiti.
Chondropoma weinlandi superba Henderson and Simpson	Haiti.
Cyclostoma (*Chondropoma*) *eusarcum* Pfeiffer	Santo Domingo
Cyclostoma magnifica (Salle) Pfeiffer	Santo Domingo
Cyclostoma (*Tudora*) *nobilis* Pfeiffer	Santo Domingo.

The group of *Chondropomium ambigua:*

Cyclostoma ambigua Lamarck	Haiti.
Cyclostoma gutierezi (Gundlach) Pfeiffer	Eastern Cuba.
Cyclostoma andrewsae Ancey	Utilla.

The group of *Chondropomium lindeniana:*

Chondropoma lindeniana Weinland	Haiti.
Cyclostoma loweana Pfeiffer	Santo Domingo.
Cyclostoma papyracea Adams	Jamaica.
Cyclostoma rubicundum Morelet	Guatemala.
Cyclostoma plicatulum Pfeiffer	Venezuela.

CHONDROPOMETES, new subgenus.

Shell of turbinate form, openly umbilicated, marked by axial and spiral threads. Operculum typically chondropomoid with the nucleus subcentral.

Type of the subgenus.—*Chondropoma vignalensis* (Gundlach) Pfeiffer.

The following species are referred to this subgenus:

Chondropoma vignalensis (Wright) Pfeiffer	Western Cuba.
Cyclostoma latilabre Orbigny	Western Cuba.

CHONDROPOMARTES, new subgenus.

Shell of ovate-conic form, the intersections of the axial ribs and spiral threads forming sharp cusps. Operculum typically Chondropomoid.

Type of the subgenus.—*Chondropoma presasiana* (Gundlach) Pfeiffer.

The following species are now referred to this subgenus:

Chondropoma presasiana (Gundlach) Pfeiffer	Matanzas, Cuba.
Chondropoma scobina (Gundlach) Pfeiffer	Western Cuba.
Chondropoma discolorans (Wright) Pfeiffer	Western Cuba.
Cyclostoma dunkeri Arango	Eastern Cuba.
Chondropoma rufopictum (Gundlach) Pfeiffer	Eastern Cuba.

CHONDROPOMORUS, new subgenus.

Shell elongate-conic, marked by both axial and spiral threads, the axial threads being gathered into tufts at the summits of the whorls.

Type of the subgenus.—Cyclostoma dentatum Say.

The following species are now referred to this subgenus. They fall into two groups, as follows:

The group of *Chondropomorus dentatum:*

Cyclostoma dentatum Say	Florida–Cuba.
Chondropoma dilatatum (Gundlach) Pfeiffer	Eastern Cuba.
Cyclostoma neglectum (Gundlach) Pfeiffer	Eastern Cuba.
Cyclostoma delatreanum Orbigny	Central Cuba.
Cyclostoma canescens Pfeiffer	East-Central Cuba.
Cyclostoma revinctum Poey	Eastern Cuba, Bahamas.
Cyclostoma salleana Pfeiffer	Santo Domingo.
Cyclostoma litturatum Pfeiffer	Santo Domingo.
Cyclostoma (*Chondropoma*) *hemiotum* Pfeiffer	Santo Domingo.
Cyclostoma petitiana Pfeiffer	Haiti.
Cyclostoma caricae Pfeiffer	Santo Domingo.
Chondropoma subreticulatum Maltzan	Haiti.
Chondropoma adulteratum Pfeiffer	Santo Domingo.
Chondropoma biforme Pfeiffer	Bahamas.
Cyclostoma erectum (Gundlach) Pfeiffer	Eastern Cuba.
Chondropoma abnatum (Gundlach) Pfeiffer	Eastern Cuba.
Chondropoma textum (Gundlach) Pfeiffer	Eastern Cuba.
Cyclostoma candeanum Orbigny	Eastern Cuba.
Cyclostoma crenulata Ferussac	Guadeloupe.
Cyclostoma (*Chondropoma*) *newtoni* Shuttleworth	Porto Rico.
Cistula riisei Pfeiffer	Porto Rico.
Chondropoma rawsoni Pfeiffer	Bahamas.
Chondropoma watlingense Dall	Bahamas.

The group of *Chondropomorus santacruzense:*

Chondropoma santacruzense Pfeiffer	St. Croix.
Cyclostoma basicarinatum Pfeiffer	St. Croix.
Cyclostoma newcombianum C. B. Adams	St. Thomas.
Chondropoma tortolense Pfeiffer	Tortola.
Adamsiella chordata (Gundlach) Pfeiffer	Eastern Cuba.

Subgenus CHONDROPOMA Pfeiffer.

1847. *Chondropoma* Pfeiffer, Zeitschr. Malak., vol. 6, p. 109.

Shell ranging in form from ovate-conic to elongate-conic. The axial sculpture consists of ribs or riblets which vary considerably in strength in the different species. The riblets are never gathered into tufts at the summit. The spiral sculpture is also quite variable, but regardless of its strength it is found upon all parts of the spire and base. The peristome may be simple or expanded. No breathing device is present. Operculum typically Chondropomoid.

Type of the subgenus.—Cyclostoma semilabre Lamarck.

The following species fall into this subgenus, in five groups:

The group of *Chondropoma raveni:*

Cistula raveni Crosse	Curacoa.
Cylostoma serraticosta Weinland	Haiti.
Colobostylus rollei Weinland	Haiti.

The group of *Chondropoma semilabre:*

Cyclostoma semilabre Lamarck	Haiti.
Chondropoma navassense Tryon	Navassa.
Cyclostoma (*Chondropoma*) *blandum* Pfeiffer	Santo Domingo.
Cyclostoma (*Chondropoma*) *blauneri* Shuttleworth	Porto Rico.
Cyclostoma (*Chondropoma*) *swifti* Shuttleworth	Porto Rico.
Chondropoma brownianum Weinland	Haiti.
Chondropoma hjalmersoni Pfeiffer	Bahamas.
Cyclostoma moestum (Shuttleworth) Pfeiffer	Matanzas.
Chondropoma garceanum Torre	Matanzas.
Cyclostoma revocatum Gundlach	Eastern Cuba.
Chondropoma wilcoxi Pilsbry and Henderson	Central Cuba.
Chondropoma ernesti Pfeiffer	Eastern Cuba.

The group of *Chondropoma irradians:*

Cyclostoma irradians (Shuttleworth) Pfeiffer	Matanzas.
Cyclostoma grunneri Pfeiffer	Honduras.

The group of *Chondropoma pictum:*

Cyclostoma pictum Pfeiffer	Matanzas.
Chondropoma yucayum (Presas) Pfeiffer	Matanzas.
Cyclostoma dissolutum Poey	Isle of Pines.
Cyclostoma pfeifferianum Poey	Havana.
Cyclostoma poeyanum Orbigny	Havana.
Chondropoma tenuilirata Pfeiffer	Havana.
Cyclostoma perlatum Gundlach	Matanzas.
Cyclostoma laetum (Gutierrez) Poey	Eastern Cuba.

The group of *Chondropoma obesum:*

Truncatella obesum Menke	Matanzas.
Chondropoma carenasense Pilsbry and Henderson	Central Cuba.
Chondropoma carenasense guantanamensis Torre	Eastern Cuba.
Chondropoma oxytremum (Gundlach) Pfeiffer	Eastern Cuba.
Chondropoma solidulum (Gundlach) Pfeiffer	Eastern Cuba.
Chondropoma solidulum tanamensis Torre	Eastern Cuba.
Cyclostoma (*Chondropoma*) *simplex* Pfeiffer	Santo Domingo.
Chondropoma caribbeum Clapp	Swan Island.
Chondropoma marginalbum (Gundlach) Pfeiffer	Eastern Cuba.
Cyclostoma (*Chondropoma*) *kisslingianum* Weinland	Haiti.
Ctenopoma bryanti Pfeiffer	Bahamas.
Cyclostoma rufilabre (Beck) Potiez and Michaud	Lesser Antilles.
Chondropoma julieni Pfeiffer	Sombrero Island.
Chondropoma ignea Reeve	Lesser Antilles.

CHONDROTHYRA, new genus.

Shell ranging in form from turbinate to elongate-conic. The sculpture in varying intensity may consist of axial ribs only, or of axial ribs and spiral threads. All, even those without spiral sculpture on the spire and base, have spiral threads on the umbilical wall. A special breathing device is present in all members of this genus. This may consist of a pore connected with the outer edge of the peristome, as in the subgenus *Chondrothyrium*, or of a puncture without slit, as in the subgenera *Chondrothyroma*, *Chondrothyra*, and *Chondrothyretes*. The operculum is simple; that is, it consists of a chondroid plate made up of a varying number of whorls, the outer thin edges of which are sometimes faintly upturned to form a suggestion of an obsolete lamella. The outer surface of the operculum has a deposit of calcareous granules, which is usually very slight, but in some species rather pronounced.

Type of the genus.—Cyclostoma egregium (Gundlach) Pfeiffer.

CHONDROTHYRIUM, new subgenus.

Shell of ovate-conic form marked by axial and spiral threads. Breathing pore present in the parietal wall, connected with the outer edge of the peristome by a slit. Operculum typically Chondropomoid.

Type of the subgenus.—Cyclostoma violaceum Pfeiffer.

The following species are now referred to this subgenus:

Cyclostoma violaceum Pfeiffer	Central Cuba.
Cyclostoma crenimargo Pfeiffer	Central Cuba.

CHONDROTHYROMA, new subgenus.

Shell turbinate, openly umbilicated, marked by axial ribs only, excepting the umbilical wall, which shows strong spiral threads. The breathing pore is on the parietal wall, a little behind the broadly expanded peristome, close to the posterior angle of the aperture. Operculum typically Chondropomoid with subcentral nucleus.

Type of the subgenus.—Cyclostoma sagebieni Poey.

The type species is the only one known of this group at present. It comes from western Cuba.

CHONDROTHYRA, new subgenus.

Shell varying from ovate-conic to elongate-conic, marked by axial and spiral threads. Peristome broadly expanded in one plane; that is, not notched or inbent at the umbilicus. The breathing pore perforates the parietal wall a little behind the peristome and a little anterior to the posterior angle of the aperture. Operculum typically Chondropomoid.

Type of the subgenus.—Cyclostoma egregium (Gundlach) Poey.

The following species are now referred to this subgenus. They fall into two groups as follows:

The group of *Chondrothyra egregium:*

Cyclostoma egregium (Gundlach) Poey	Western Cuba.
(*Licina percrassa* (Wright) Pfeiffer)	Western Cuba.

The group of *Chondrothyra canaliculata:*

Chondropoma hendersoni Torre	Western Cuba.
Chondropoma canaliculata (Gundlach) Pfeiffer	Western Cuba.
Chondropoma deceptor Arango	Western Cuba.
Chondropoma hamlini Arango	Western Cuba.

CHONDROTHYRETES, new subgenus.

Shell varying from ovate-conic to elongate-conic, marked by axial and spiral threads. Peristome broadly expanded, notched or inbent at the umbilicus. The breathing pore perforates the parietal wall a little behind the peristome, and a little anterior to the posterior angle of the aperture. In some of the members of this subgenus the exterior perforation leads to the surface at the posterior angle of the aperture; in others to the umbilicus; in the species which have the umbilicus sealed with a callus the breathing pore communicates with the exterior by means of the hollow axis and the opening at the truncated summit of the shell. Operculum typically Chondropomoid.

Type of the subgenus.—*Cyclostoma shuttleworthi* Pfeiffer.

The following species are now referred to this subgenus. They fall into two groups as follows:

The group of *Chondrothyrates shuttleworthi:*

Cyclostoma shuttleworthi Pfeiffer	Western Cuba.
Cyclostoma shuttleworthi incrassatum (Wright) Pfeiffer	Western Cuba.
Cyclostoma (*Chondropoma*) *shuttleworthi gundlachi* Arango	Western Cuba.
Chondropoma foveatum (Gundlach) Pfeiffer	Western Cuba.
Cyclostoma ottonis Pfeiffer	Western Cuba.
Cyclostoma claudicans Poey	Western Cuba.
Chondropoma excisum (Gundlach) Pfeiffer	Western Cuba.
Chondropoma unilabiatum (Gundlach) Pfeiffer	Eastern Cuba.
Cyclostoma tenebrosum Morelet	Western Cuba.
Cyclostoma sericatum Morelet	Western Cuba.
Chondropoma assimile (Gundlach) Pfeiffer	Western Cuba.

The group of *Chondrothyretes sinuosa:*

Chondropoma sinuosa (Wright) Pfeiffer	Western Cuba.
Chondropoma echinulata (Wright) Pfeiffer	Western Cuba.

RHYTIDOPOMINAE, new subfamily.

Shell ranging in form from turbinate to elongate-conic. The sculpture may be axial ribs only, or axial ribs on the spire and base, with spiral cords in the umbilicus, or axial and spiral threads on spire and base. In strength the sculptural elements may vary in different species from lamellar to obsolete. A breathing device may be present or absent; these are discussed under the subdivision in which they occur. The operculum in all forms has as a basis a chondroid plate composed of a number of whorls. The outer edge of these whorls is never upturned to form a strong lamella. The outer surface of the lamellae bears a calcareous deposit which may consist of simple retractively curved riblets that may remain distinct or may become fused into a solid plate. These deposits may cover the entire width of the whorl or only a fraction thereof. The inner and outer termination of the ribs may or may not fuse to form a strong spiral lamella, but in no instance does the inner lamella rise up as a simple spiral band as in the Adamsiellinae nor become reflected outward and calcified as a second or roofing plate as in the Annularinae.

Type genus.—Rhytidopoma Sykes.

RHYTIDOTHYRA, new genus.

Shell elongate-ovate, marked by both axial and spiral threads. The breathing pore communicates with a tube located in the posterior angle, extending backward for more than three whorls. This tube, in turn, communicates, by slender clefts, with the hollow axis, through which breathing is evidently effected when the operculum is closed. The operculum consists of many strongly raised, retractively curved lamellar ribs, which extend completely across the turns. These lamellar ribs are high at their inner edge, from which they pass down in a gentle curve, rising again to their highest altitude at their outer border, where they become fused into a spiral lamella, which projects almost as far as the basal chondroid plate. The lateral margin of the operculum is strongly channeled.

Type of the genus.—Cyclostoma bilabiatum Orbigny.

Genus PARACHONDRIA Dall.

1905. *Parachondria* Dall, Proc. Malac. Soc. London, vol. 6, p. 209.

Shell ranging in shape from elongate-ovate to elongate-conic, marked by axial ribs only or by axial ribs and spiral threads which are confined to the umbilicus or by axial and spiral threads on spire and base or slender axial lamellae and subobsolete spiral threads which give to the axial sculpture an articulate appearance. No breathing device is present. The operculum has the inner portion of its turns covered by a calcareous deposit which consists of numerous low retractively curved fused riblets, which are not fused into a raised lamella at their outer edge, nor does the calcareous deposit extend to the edge of the chondroid basal plate. There is thus left a narrow channel in the bottom of which the chrondroid plate may be seen at the outer edge of each whorl.

Type of the genus.—Turbo fascia Wood.

PARACHONDRISCA, new subgenus.

Shell elongate-conic, marked by axial riblets only. No trace of spiral riblets, even in the umbilicus, is present. Operculum typically Parachondroid.

Type of the subgenus.—Cyclostoma umbricola Weinland.

Of this subgenus the type species only is known. It comes from Haiti.

PARACHONDRELLA, new subgenus.

Shell elongate-conic, marked by axial ribs, spiral sculpture confined to the umbilicus. Operculum typically Parachondroid.

Type of the subgenus.—Cyclostoma fecunda C. B. Adams.

The following species are now referred to this subgenus:

Turbo columna Wood	Jamaica.
Cyclostoma adamsi Pfeiffer	Jamaica.
Cyclostoma avena C. B. Adams	Jamaica.
Cyclostoma fecunda C. B. Adams	Jamaica.
Cyclostoma fecunda distincta C. B. Adams	Jamaica.
Cyclostoma armata C. B. Adams	Jamaica.
Cyclostoma maritima C. B. Adams	Jamaica.
Cyclostoma maritima aurora C. B. Adams	Jamaica.

Subgenus PARACHONDRIA Dall.

1905. *Parachondria* Dall, Proc. Malac. Soc. London, vol. 6, p. 209.

Shell elongate-conic, marked by strong axial and spiral threads. Operculum typically Parachondroid.

Type of the subgenus.—Turbo fascia Wood.

The following species are now referred to this subgenus. They fall into two groups as follows:

The group of *Parachondria fascia:*

Turbo fascia Wood	Jamaica.
Cyclostoma fascia proxima C. B. Adams	Jamaica.
Cyclostoma barklyana Chitty	Jamaica.
Cyclostoma simulans C. B. Adams	Jamaica.
Cyclostoma angustae C. B. Adams	Jamaica.

The group of *Parachondria dentilobata:*

Cyclostoma quarternata Lamarck	Haiti.
Cyclostoma hydii Weinland	Inagua.
Cyclostoma pupaeformis Sowerby	Haiti.
Cyclostoma aminensis Pfeiffer	Santo Domingo.
Cyclostoma emilianum Weinland	Haiti.
Cistula capillacea Pfeiffer	Santo Domingo.
Cyclostoma cinclidodes Pfeiffer	Santo Domingo.
Cyclostoma dentilobata Weinland	Haiti.
Cyclostoma tappaniana C. B. Adams	Jamaica.
Parachondria (*Parachondria*) *gonavicola*, new species	Haiti.

PARACHONDROPS, new subgenus.

Shell ranging in shape from elongate-ovate to elongate-conic. The axial sculpture consists of slender sublamellar riblets, which are rendered wavy or articulate by the ill-defined spiral sculpture. Operculum typically Parachondroid.

Type of the subgenus.—*Cyclostoma campbelli* C. B. Adams.

The following species are now referred to this subgenus:

Cyclostoma campbelli C. B. Adams	Jamaica.
Cyclostoma sheppardiana C. B. Adams	Jamaica.
Rhytidopoma fraterminor Pilsbry and Brown	Jamaica.
Ctenopoma nigriculum (Gundlach) Pfeiffer	Eastern Cuba.
Ctenopoma jeannereti Pfeiffer	Eastern Cuba.
Cyclostoma wilkinsoni C. B. Adams	Jamaica.
Tudora lurida (Gundlach) Pfeiffer	Eastern Cuba.

Genus OPISTHOSIPHON Dall.

1905. *Opisthosiphon* Dall, Proc. Malac. Soc. London, vol. 6, p. 209.

Shell ranging in shape from turbinate to elongate-conic, marked by axial ribs and spiral threads. In the subgenus *Opisthosiphona* the latter are confined to the umbilicus, while in *Opisthosiphon* they are found both on the spire and base. All members of this genus have a breathing siphon situated on the angle formed by the junction of the parietal and outer walls a little behind the peristome. In some forms this siphon is a mere upright tube; in others, it is flexed and bent to pass through the chink formed behind the peristome when the last whorl is solute, the breathing pore thus communicating with the hollow axis. In some forms where the whorl is not solute, the siphon is reflected backward. Operculum typically Parachondroid.

Type of the genus.—*Cyclostoma bahamense* Shuttleworth.

OPISTHOSIPHONA, new subgenus.

Shell ranging from turbinate to elongate-conic. Spire and base marked by axial riblets; spiral threads confined to the umbilicus. Breathing siphon present. Operculum typically Parachondroid.

Type of the subgenus.—*Cyclostoma moreletiana* Petit.

The following species are now referred to this subgenus. They fall into two groups, as follows:

The group of *Opisthosiphona moreletianum:*

Cyclostoma moreletianum Petit	Isle of Pines.
Cyclostoma pupoides Morelet	Isle of Pines.
Tudora excurrens (Gundlach) Pfeiffer	Eastern Cuba.
Opisthosiphon berryi Clapp	Eastern Cuba.
Opisthosiphon (*Opisthosiphona*) *berryi semiapertus* Torre and Henderson	Eastern Cuba.
Opisthosiphon (*Opisthosiphona*) *paredonensis* Torre and Henderson	Eastern Cuba.
Opisthosiphon (*Opisthosiphona*) *obturatus* Torre and Henderson	Eastern Cuba.
Opisthosiphon (*Opisthosiphona*) *subobturatus* Torre and Henderson	Eastern Cuba.
Opisthosiphon (*Opisthosiphona*) *apertus* Torre and Henderson	Eastern Cuba.
Opisthosiphon (*Opisthosiphona*) *bioscai* Torre and Henderson	Eastern Cuba.
Opisthosiphon (*Opisthosiphona*) *salustii* Torre and Henderson	Eastern Cuba.
Opisthosiphon (*Opisthosiphona*) *occultus* Torre and Henderson	Eastern Cuba.
Opisthosiphon (*Opisthosiphona*) *trincheracensis* Torre and Henderson	Eastern Cuba.

Opisthosiphon (*Opisthosiphona*) *protractus* Torre and Henderson	Eastern Cuba.
Opisthosiphon (*Opisthosiphona*) *judacensis* Torre and Henderson	Eastern Cuba.
Opisthosiphon (*Opisthosiphona*) *detectus* Torre and Henderson	Eastern Cuba.
Opisthosiphon (*Opisthosiphona*) *obtectus* Torre and Henderson	Eastern Cuba.

Descriptions of the last thirteen forms are now going through press.

The group of *Opisthosiphona dalli:*

Opisthosiphon (*Opisthosiphona*) *dalli* Torre and Henderson	Eastern Cuba.

Subgenus OPISTHOSIPHON Dall.

1905. *Opisthosiphon* Dall, Proc. Malac. Soc. London, vol. 6, p. 209.

Shell elongate-conic, marked by axial and spiral threads on base and spire. External breathing siphon present at the posterior angle. Operculum typically Parachondroid.

Type of the subgenus.—Cyclostoma bahamense Shuttleworth.

The following species are now referred to this subgenus:

Cyclostoma bahamense Shuttleworth	Bahamas.
Cyclostoma sculptum (Gundlach) Pfeiffer	Eastern Cuba.
Cyclostoma echinatum (Gundlach) Pfeiffer	Eastern Cuba.

Genus XENOPOMA Crosse.

1890. *Xenopoma* Crosse, Journ. Conchyl., vol. 38, p. 282.

Shell elongate-conic; the last part of the last whorl is detached and deflected considerably below the preceding turn. The sculpture consists of widely spaced ribs which bear strong hollow cusplike tubercles at their intersections with the obsolete spiral cords. In addition to this, fine wavy axial threads occur between the cusped ribs. Peristome reflected, widely expanded and fluted. Operculum marked by retractively curved ribs, which do not extend across the entire width of the whorls. The inner border of these ribs is fused to form a lamella, which is a little higher than the ribs. The outer border of the ribs become fused to form an enormously developed lamella in the last turn, which is reflected domelike inward over the operculum and almost completely covers it. This reflected lamella bears fine corrugations on its surface. The edge of the operculum is concave.

Type of the genus.—Choanopoma hystrix (Wright) Pfeiffer.

The following species are now referred to this genus:

Choanopoma hystrix (Wright) Pfeiffer	Eastern Cuba.
Choanopoma humboldtiana Pfeiffer	Eastern Cuba.

Genus RHYTIDOPOMA Sykes.

1901. *Rhytidopoma* Sykes, Journ. Malac., vol. 8, p. 60.

Shell elongate-conic, axial riblets and spiral threads present in all the known species; the axial sculpture is usually stronger than the spiral. A recurved breathing siphon is present a little behind the peristome at the junction of the parietal and outer wall. Operculum with the ribs not completely covering the whorls, thus showing the basal chondroid plate in a narrow sinus, which marks the outer edge of the turns. Both the inner and outer end of the retractively curved ribs are fused into lamellae, which are considerably higher than the ribs which extend in a gentle curve between them.

Type of the genus.—Cyclostoma rugulosum Pfeiffer.

The following species are now referred to this genus:

Cyclostoma rugulosum Pfeiffer	Matanzas
Cyclostoma nodulatum Poey	Matanzas.
Cyclostoma clathratum Gould	Matanzas.
Ctenopoma wrightianum (Gundlach) Arango	Western Cuba.
Ctenopoma nodiferum Arango	Cuba.
Cyclostoma honestum Poey	Havana.
Cyclostoma coronatum Poey	Havana.

TORRELLA, new genus.

Shell elongate-conic, marked by sublamellar axial riblets only on the spire, or by sublamellar axial riblets and obsolete spiral threads. The umbilicus may be marked by weak or strong spiral cords. Peristome expanded, simple or fimbriated. Breathing siphon almost straight or decidedly flexed and bent into the umbilicus. Operculum with the ribs occupying only a portion of each whorl and as high as the inner and outer lamellae, which are formed by the fusing of the ribs. Dedicated to Dr. Carlos de la Torre.

Type of the genus.—Ctenopoma torreianum (Gundlach) Arango.

TORRELLA, new subgenus.

Shell elongate-conic, marked by slender sublamellar axial ribs and obsolete spiral cords. The latter render the ribs somewhat sinuous, and slightly foliate at their junctions. Umbilicus marked by strong spiral cords. Peristome expanded and fimbriated at the edge. Breathing siphon strongly flexed and bent into the umbilicus, which it completely closes. Breathing, when the animal is withdrawn, is effected through the hollow axis of the shell. Operculum typical Torrelid.

Type of the subgenus.—Ctenopoma torreianum (Gundlach) Arango.

The following species are now referred to this subgenus:

Ctenopoma torreiana (Gundlach) Arango	Havana.
Cyclostoma deficiens Gundlach	Matanzas.
Cyclostoma immersum Gundlach	Matanzas.

TORRELLISCA, new subgenus.

Shell elongate-conic, marked by slender sublamellar axial riblets only on the spire. Umbilicus marked by weak spiral cords. Peristome expanded but not fimbriated. Breathing siphon a simple tube but slightly bent, opening on the outside. Operculum typically Torrellid.

Type of the subgenus.—*Torrella* (*Torrellisca*) *simpsoni*, new species.

The type species is the only one known of this group at present. It comes from central Cuba.

ADAMSIELLINAE, new subfamily.

Shell ranging in form from ovate-conic to elongate-conic, marked by axial and spiral sculpture of equal strength, giving the surface a granulose appearance, or by axial ribs stronger than the spiral threads, the latter giving the ribs an articulate appearance. In two groups the ribs are gathered into tufts at the summit. No special breathing device has been observed in any of the species. The operculum consists of a chondroid basal plate composed of several whorls, in which the upturned outer edge of the preceding whorl is strengthened and built into a strongly elevated lamella by the inner edge of the succeeding turn. There is no ribbing or buttressing to this lamella.

Type genus.—*Adamsiella* Pfeiffer.

Genus ADAMSIELLA Pfeiffer.

1851. *Adamsiella* Pfeiffer, Zeitschr. Malak., p. 155.

The definition for the subfamily may cover the genus.

Type of the genus.—*Turbo mirabilis* Wood.

Subgenus ADAMSIELLA Pfeiffer.

1851. *Adamsiella* Pfeiffer, Zeitschr. Malak., p. 155.

Shell ranging from ovate-conic to elongate-conic in form. Axial and spiral sculpture about equal, producing a granular surface. Operculum typically Adamsielloid.

Type of the subgenus.—*Turbo mirabilis* Wood.

The following species are now referred to this subgenus. They fall into three groups as follows:

The group of *Adamsiella mirabilis*:

Turbo mirabilis Wood	Jamaica.
Cyclostoma irrorrata Gloyne	Jamaica.
Cyclostoma variabilis C. B. Adams	Jamaica.
Cyclostoma grayana Pfeiffer	Jamaica.
Adamsiella grayana aureolabre Simpson	Jamaica.

The group of *Adamsiella pulchrior*:

Cyclostoma pulchrior C. B. Adams	Jamaica.

The group of *Adamsiella monstrosa*:

Cyclostoma moribunda C. B. Adams	Jamaica.
Cyclostoma intermedia C. B. Adams	Jamaica.

Cyclostoma monstrosa C. B. Adams	Jamaica.
Cyclostoma pearmanaeanum Chitty	Jamaica.
Cyclostoma simillima Vendryes	Jamaica.
Adamsiella jarvisi Henderson	Jamaica.
Cyclostoma miranda C. B. Adams	Jamaica.

ADAMSIELLOPS, new subgenus.

Shell ranging from ovate-conic to elongate-conic in form. Axial sculpture stronger than the spiral, the latter imparting an articulated appearance to the ribs. Operculum typically Adamsielloid.

Type of the subgenus.—Cyclostoma ignilabre C. B. Adams.

The following species are now referred to this subgenus. They fall into two groups as follows:

The group of *Adamsiellops antiguense*:

Choanopoma occidentale Pfeiffer	Lesser Antilles.
Cyclostoma antiguense Shuttleworth	Lesser Antilles.
Cyclostoma lugubris Pfeiffer	Lesser Antilles.

The group of *Adamsiellops ignilabre*:

Cyclostoma ignilabre C. B. Adams	Jamaica.

ANNULARINAE, new subfamily.

Shell ranging in form from helicoid to elongate-conic. The axial sculpture may be almost obsolete or it may consist of strong ribs or many slender lamellae which may or may not be gathered into tufts at the summit. The spiral sculpture may be absent, confined to the umbilicus, or cover spire and base. In strength the spiral sculpture varies from fine threads to strong cords. Breathing devices are present in some groups and absent in others. They range from a mere notch or slit puncture to a pore with external siphon. The operculum may be flat or convex on the outside, provided with strong calcified lamellae, which rise from the inner edge of the whorls. These lamellae may be vertically placed upon the basal plate or they may be obliquely situated or reflected to parallel the basal plate. They may be almost smooth or ribbed.

Type genus.—Annularia Schumacher.

Genus ANNULARIA Schumacher.

1817. *Annularia* Schumacher, Nouv. Syst. Hab. Vers Test., pp. 60 and 196.

Shell ranging in form from turbinate to elongate-conic. The sculpture may consist of axial riblets only, or of axial riblets and spiral threads. The latter may be confined to the umbilicus or may be present on the entire shell. There is a great range of variation in the strength of these sculptural features in different species. Breathing devices may be present or absent. The operculum consists of a chondroid plate, composed of a number of whorls which bear an oblique calcified spiral lamella on their inner edge, which is obliquely deflected outward. This lamella is always finely obliquely striated, the striations varying considerably in strength in different species.

Type of the genus.—Turbo lincina Linnaeus.

ANNULARISCA, new subgenus.

Shell depressed helicoid, widely umbilicated, marked on spire and base by axial riblets. No trace of spiral sculpture is present, even on the umbilical wall. Operculum typically Annularid.

Type of the subgenus.—Choanopoma eburneum (Gundlach) Pfeiffer.

The type species is the only one known of this group at present. It comes from Eastern Cuba.

ANNULAROSA, new subgenus.

Shell turbinate, umbilicated. The early whorls with faint axial riblets, which become quite obsolete on the last turn. Umbilicus marked by spiral cords. Operculum typically Annularid.

Type of the subgenus.—Choanopoma fragile (Gundlach) Pfeiffer.

The type species is the only one known of this group at present. It comes from eastern Cuba.

Subgenus ANNULARIA Schumacher.

1817. *Annularia* Schumacher, Nouv. Syst. Hab. Vers Test., pp. 60 and 196.

Shell ranging in form from turbinate to elongate-conic. Axial sculpture consisting of almost uniform riblets, varying considerably in strength and spacing in different species. Spiral sculpture ranging from weak to very strong, covering spire and base, usually more strongly expressed within the umbilicus. Peristome thin, broadly expanded. Operculum typically Annularid.

Type of the subgenus.—Turbo lincina Linnaeus.

The following species are now referred to this subgenus. They fall into four groups, as follows:

The group of *Annularia fimbriatulum*:

Turbo pulchrum Wood	Jamaica.
Cyclostoma fimbriatulum Sowerby	Jamaica.
Cyclostoma fimbriatulum docens C. B. Adams	Jamaica.
Cyclostoma fimbriatulum albinodatum C. B. Adams	Jamaica.
Cyclostoma chittyi C. B. Adams	Jamaica.
Cyclostoma scabriusculum C. B. Adams	Jamaica.
Cyclostoma scabriusculum amabile C. B. Adams	Jamaica.
Cyclostoma hillianum C. B. Adams	Jamaica.
Cyclostoma hillianum amandum C. B. Adams	Jamaica.
Cyclostoma hillianum aculeosum C. B. Adams	Jamaica.
Cyclostoma hillianum leporilabre C. B. Adams	Jamaica.
Cyclostoma mite C. B. Adams	Jamaica.
Cyclostoma lincinellum Lamarck	Jamaica.

The group of *Annularia lincina:*

Turbo lincina Linnaeus	Jamaica.
Cyclostoma lima C. B. Adams	Jamaica.
Cyclostoma lima blandiana C. B. Adams	Jamaica.
Cyclostoma pisum C. B. Adams	Jamaica.

The group of *Annularia illustris:*

Cyclostoma minium Gundlach	Eastern Cuba.
Choanopoma bebini (Arango) Pfeiffer	Western Cuba.
Cyclostoma tractum Gundlach	Western Cuba.
Choanopoma jiguanensis Pfeiffer	Eastern Cuba.
Cyclostoma perplicatum Gundlach	Cuba.
Cyclostoma arangianum Gundlach	Eastern Cuba.
Cyclostoma decussatum Lamarck	Porto Rico.
Cyclostoma (*Choanopoma*) *senticosum* Shuttleworth	Porto Rico.
Cyclostoma sulculosum Ferussac	Porto Rico.
Cyclostoma trochlearis Pfeiffer	Mexico.
Choanopoma storchi Pfeiffer	Eastern Cuba.
Cyclostoma largillierti Pfeiffer	Yucatan.
Cyclostoma mordax C. B. Adams	Jamaica.
Cyclostoma inculta Poey	Central Cuba.
Cyclostoma illustris Poey	Central Cuba.
Cyclostoma sauliae Sowerby	Jamaica.

The group of *Annularia lachneri:*

Choanopoma lachneri Pfeiffer	Eastern Cuba.
Choanopoma blandi Weinland	Haiti.

ANNULARITA, new subgenus.

Shell ovate-conic, marked by both axial riblets and spiral threads. Peristome not expanded into a broad thin disk, but much thickened, slightly flaring to a thin edge. Operculum typically Annularid.

Type of the subgenus.—Cyclostoma majusculum Morelet.

The type species is the only one known of this group at present. It comes from western Cuba.

ANNULARELLA, new subgenus.

Shell ranging in form from turbinate to elongate-ovate. The axial sculpture consists of sublamellar axial ribs between which finer threads parallelling these are present. The spiral sculpture varies considerably in strength in different species. Operculum typically Annularid.

Type of the subgenus.—Cyclostoma (*Choanopoma*) *yunquense* Pfeiffer.

The following species are now referred to this subgenus. They fall into two groups as follows:

The group of *Annularella yunquense:*

Choanopoma yunquense Pfeiffer	Eastern Cuba.
Annularia pseudalatum Torre	Eastern Cuba.

The group of *Annularella bertini:*

Choanopoma bertini Maltzan	Haiti.
Choanopoma bertini gracillima Maltzan	Haiti.

ANNULAROPS, new subgenus.

Shell ranging in form from elongate-ovate to elongate-conic. Axial riblets sublamellar, rendered articulate by the spiral scuplture. Parietal wall perforated by a breathing pore near the posterior angle. Operculum typically Annularid.

Type of the subgenus.—Choanopoma blaini (Gundlach) Pfeiffer.

The following are now referred to this subgenus:

Choanopoma sauvallei (Gundlach) Pfeiffer	Western Cuba.
Cyclostoma sordidum (Gundlach) Poey	Western Cuba.
Choanopoma tryoni Arango	Western Cuba.
Choanopoma blaini (Gundlach) Pfeiffer	Western Cuba.

ANNULARODES, new subgenus.

Shell elongate-ovate, marked by regular nonarticulate axial ribs and fine spiral threads; breathing pore provided with an external siphon. Operculum typically Annularid.

Type of the subgenus.—Choanopoma uncinatum Arango.

The type species is the only one known of this group at present. It comes from Central Cuba.

Genus BLAESOSPIRA Crosse.

1890. *Blaesospira* Crosse, Journ. Conchyl., vol. 38, p. 280.

Shell ranging in form from ovate-conic to elongate-conic. All the whorls or only the last portion of the last whorl may be solute. The axial sculpture consists of distantly spaced ribs, between which finer axial threads are present. The spiral sculpture consists of a series of spiral cords that form strong hollow tubercles at their junction with the axial ribs. Operculum with the calcified spiral lamella rising vertically from the whorls.

Type of the genus.—Cyclostoma (Choanopoma) echinus (Wright) Pfeiffer.

The following species are now referred to this genus. They fall into two groups as follows:

The group of *Blaesospira echinus:*

Cyclostoma (Choanopoma) echinus (Wright) Pfeiffer	Western Cuba.

The group of *Blaesospira pretrei:*

Cyclostoma pretrei Orbigny	Western Cuba.

ABBOTTELLA, new genus.

Shell depressed, helicoid, marked by axial ribs between which finer wavy axial threads are present. The spiral sculpture consists of obsolete cords, the intersection of which with the axial ribs forms tubercles ranging in strength from minute to strong and hollow projections. Operculum with the calcified spiral lamella rising vertically from the whorl. Dedicated to Dr. W. L. Abbott.

Type of the genus.—*Choanopoma moreletianum* Crosse.

The following species are now referred to this genus:

Cyclostoma tentorium Pfeiffer	Haiti–Santo Domingo.
Choanopoma solutum (Richard) Pfeiffer	Santo Domingo.
Choanopoma newcombi Crosse	Santo Domingo.
Choanopoma rosaliae Pfeiffer	Santo Domingo.
Cyclostoma (*Choanopoma*) *adolfi* Pfeiffer	Santo Domingo.
Choanopoma gabbi Crosse	Santo Domingo.
Choanopoma morletianum Crosse	Santo Domingo.
Choanopoma wilhelmi Pfeiffer	Santo Domingo.

Genus TUDORA Gray.

1850. *Tudora* Gray, Brit. Mus. Cat. Cycloph., p. 48.

Shell ranging from helicoid to elongate-conic in form, marked by axial ribs only, or with axial ribs and spiral sculpture. The latter may be confined to the umbilicus or may be present on spire and base. The axial sculpture varies from strong to almost obsolete, or it may consist of slender sublamellar riblets. The spiral sculpture is equally variable as far as strength is concerned in the different species. Breathing devices are not present in this genus. The operculum has a basal chondroid plate composed of a number of whorls, the inner edge of which develops a strong calcified lamella which is reflected outward until it parallels the base. The lamellae are usually marked by fine retractively slanting striations or riblets.

Type of the genus.—*Cyclostoma megacheilos* Potiez and Michaud.

TUDORELLATA, new subgenus.

Shell helicoid. The axial sculpture ranges from regular simple closely crowded ribs to distantly spaced ribs with finer threads between. The spiral sculpture is present in varying intensity in the different species. The open umbilicus may or may not be bounded by a spiral cord. Operculum typically Tudoroid.

Type of the subgenus—*Cistula interstitialis* (Gundlach) Pfeiffer.

The following species are now referred to this subgenus. They fall into two groups as follows:

The group of *Tudorellata interstitialis:*

Cyclostoma roemeri Pfeiffer	Eastern Cuba.
Cistula mackinlayi (Gundlach) Pfeiffer	Eastern Cuba.
Choanopoma yateracense Pfeiffer	Eastern Cuba.
Annularia ramsdeni Pilsbry and Henderson	Eastern Cuba.
Cyclostoma heynemani Pfeiffer	Eastern Cuba.
Cistula interstitialis (Gundlach) Pfeiffer	Eastern Cuba.
Annularia mayensis Torre and Ramsden	Eastern Cuba.

Cistula cumulata Pfeiffer	Eastern Cuba.
Cyclostoma alatum Pfeiffer	Eastern Cuba.
Cyclostoma decoloratum Gundlach	Western Cuba.

The group of *Tudorellata auricomum:*

Choanopoma auricomum (Gundlach) Pfeiffer	Eastern Cuba.
Choanopoma putre (Gundlach) Pfeiffer	Eastern Cuba.

Subgenus COLOBOSTYLUS Crosse and Fischer.

1888. *Colobostylus* Crosse and Fischer, Journ. Conchyl., vol. 36, p. 229.

Shell ranging from elongate-ovate to elongate-conic. Axial ribs present, spiral sculpture absent. Operculum typically Tudoroid.

Type of the subgenus.—*Cyclostoma jayanum* C. B. Adams, selected by Dall, 1905.

The following species are now referred to this subgenus.

Cyclostoma jayanum C. B. Adams	Jamaica.
Cyclostoma jayanum rufilabre C. B. Adams	Jamaica.
Cyclostoma jayanum nigrolabre C. B. Adams	Jamaica.
Cyclostoma humphreysiana Pfeiffer	Jamaica.
Cyclostoma chevalieri C. B. Adams	Jamaica.
Cyclostoma chevalieri virgatum C. B. Adams	Jamaica.
Cyclostoma chevalieri pulchrius C. B. Adams	Jamaica.
Cyclostoma thysanoraphe Sowerby	Jamaica.

TUDORISCA, new subgenus.

Shell ranging from elongate-ovate to elongate-conic. Axial ribs present. Spiral sculpture confined to the umbilicus. Operculum typically Tudoroid.

Type of the subgenus.—*Cyclostoma albus* Sowerby.

The following species are now referred to this subgenus. They fall into two groups as follows:

The group of *Tudorisca albus:*

Cyclostoma albus Sowerby	Jamaica.
Cyclostoma albus fuscus C. B. Adams	Jamaica.
Cyclostoma tectilabris C. B. Adams	Jamaica.
Cyclostoma bronni C. B. Adams	Jamaica.
Cyclostoma lamellosum C. B. Adams	Jamaica.
Colobostylus nelsoni Clapp	Swan Island.
Cyclostoma interruptum Lamarck	Jamaica.

The group of *Tudorisca chiapensis:*

Adamsiella aripensis Guppy	Trinidad.
Choanopoma chiapensis Crosse	Mexico.
Cyclostoma tamsiana Pfeiffer	Venezuela.
Cyclostomas rectus (Gundlach) Pfeiffer	Central Cuba.
Cyclostoma crenulosus C. B. Adams	Jamaica.

Subgenus TUDORA Gray.

1850. *Tudora* Gray, Brit. Mus. Cat. Cycloph., p. 48.

Shell ranging in form from ovate-conic to elongate-conic, marked by axial ribs and spiral threads on spire and base, the former never articulated. The riblets may or may not be gathered into tufts at the summit, which may be appressed to the preceding whorl, or the suture may be channeled. Operculum typically Tudoroid.

Type of the subgenus—Cyclostoma megacheilos Potiez and Michaud.

The following species are now referred to this subgenus. They fall into four groups as follows:

The group of *Tudora rangelinum:*

Cyclostoma rangelinum Poey	Western Cuba.

The group of *Tudora abbotti:*

Tudora (*Tudora*) *abbotti*, new species	Haiti.

The group of *Tudora habichi:*

Cyclostoma habichi Weinland	Haiti.
Cyclostoma reeveana Pfeiffer	Haiti.
Cyclostoma rollei Maltzan	Haiti.
Nerita labeo Müller	"Jamaica"–Haiti.
Cyclostoma kobelti Maltzan	Haiti.

The group of *Tudora megacheila:*

Cyclostoma megacheila Potiez and Michaud	Curacoa.
Cyclostoma versicolor Pfeiffer	Bonaire.

TUDOROPS, new subgenus.

Shell ranging in form from ovate-conic to elongate-conic. The axial riblets, which are rendered articulate by the finer spiral threads, may or may not be gathered into tufts at the summit. Operculum typically Tudoroid.

Type of the subgenus—Cyclostoma banksianum Sowerby.

The following species are now referred to this subgenus. They fall into three groups as follows:

The group of *Tudorops banksianum:*

Cyclostoma banksianum Sowerby	Jamaica.
Cyclostoma yallahensis C. B. Adams	Jamaica.
Cyclostoma redfieldianum C. B. Adams	Jamaica.
Cyclostoma redfieldanum concentrica C. B. Adams	Jamaica.

The group of *Tudorops xanthostoma:*

Cyclostoma xanthostoma Sowerby	Jamaica.
Cyclostoma tenuistriata C. B. Adams	Jamaica.

The group of *Tudorops undosum:*

Ctenopoma undosum (Gundlach) Pfeiffer	Western Cuba.
Ctenopoma enode (Gundlach) Pfeiffer	Eastern Cuba.
Choanopoma troscheli Pfeiffer	Western Cuba.
Ctenopoma pulverulentum (Wright) Pfeiffer	Western Cuba.
Cyclostoma rotundatum Poey	Western Cuba.
Ctenopoma garridoianum (Gundlach) Pfeiffer	Eastern Cuba.

EUTUDORA, new genus.

Shell ranging in form from turbinate to elongate-conic. The axial sculpture may consist of sublamellar riblets, or may be almost reduced to lines of growth. The spiral sculpture may be strong or feeble. A breathing notch, slit, pore or siphon is present. Operculum typically Tudoroid.

Type of the genus.—Cyclostoma limbifera (Menke) Pfeiffer.

EUTUDORISCA, new subgenus.

Shell almost turbinate in form, spiral cords much stronger than the axial sculpture, which is decidedly reduced, almost obsolete. A notch in the parietal callus near its junction with the outer lip leaves a breathing space here, when the animal is withdrawn. Operculum typically Tudoroid.

Type of the subgenus.—Cistula jimenoi (Arango) Pfeiffer.

The following species are now referred to this subgenus:

Cistula jimenoi (Arango) Pfeiffer	Havana.
Cyclostoma catenata Gould	Havana.

EUTUDORELLA, new subgenus.

Shell almost turbinate in form. Spiral cords much stronger than the axial sculpture, which is almost obsolete. A slit in the parietal wall connects the breathing pore with the outer face of the peristome. Operculum typically Tudoroid.

Type of the subgenus.—Cistula agassizii (Charpentier) Pfeiffer.

The type species is the only one known of this group at present. It comes from Havana, Cuba.

EUTUDORA, new subgenus.

Shell almost turbinate. Spiral cords much stronger than the axial sculpture, which is almost obsolete. A breathing pore is present in the parietal wall a little anterior to the junction with the outer lip. Operculum typically Tudoroid.

Type of the subgenus.—Cyclostoma limbifera (Menke) Pfeiffer.

The type species is the only one known of this group at present. It comes from Havana, Cuba.

EUTUDOROPS, new subgenus.

Shell ranging from ovate-conic to elongate-conic. Axial sculpture consisting of slender sublamellar riblets, which are rendered wavy by the low-rounded spiral cords. Breathing pore with or without external siphon. Operculum typically Tudoroid.

Type of the subgenus.—Cyclostoma torquatum (Gutierez) Poey.

The following species are now referred to this subgenus. They fall into two groups as follows:

The group of *Eutudorops azucarensis:*

Eutudorops azucarensis, new species	Western Cuba.

The group of *Eutudorops torquatum:*

Cyclostoma torquatum (Gutierriez) Poey	Central Cuba.

Genus RAMSDENIA Preston.

1913. *Ramsdenia* Preston, Proc. Malac. Soc. London, vol. 10, p. 323.

Shell elongate-conic, marked by slender wavy sublamellar axial riblets and obsolete spiral cords. The riblets are gathered into irregular tufts at the summit. Operculum with the calcified lamella arched convexly over the entire whorl, marked by slender retractively curved threads.

Type of the genus.—Ramsdenia mirifica Preston.

The following species are now referred to this genus:

Ramsdenia mirifica Preston	Eastern Cuba.
Cyclostoma nobilitatum (Gundlach) Poey	Eastern Cuba.
Rhytidopoma tolleni Ramsden	Eastern Cuba.
Ctenopoma bufo Pfeiffer	Eastern Cuba.
Ctenopoma perspectivum (Gundlach) Pfeiffer	Eastern Cuba.
Ctenopoma semicoronatum (Gundlach) Pfeiffer	Eastern Cuba.

Genus DIPLOPOMA Pfeiffer.

1859. *Diplopoma* Pfeiffer, Malak. Blät., vol. 6, p. 73.

Shell elongate-ovate to elongate-conic, marked by strong axial riblets and spiral threads. Operculum with the calcified lamellae reflected to parallel the basal plate. The lamellae marked by strong retractively slanting riblets. The outer surface of the operculum may be flat or convex.

Type of the genus.—Diplopoma architectonicum (Gundlach) Pfeiffer.

Subgenus DIPLOPOMA Pfeiffer.

1859. *Diplopoma* Pfeiffer, Malak. Blät., vol. 6, p. 73.

Shell almost turbinate to elongate-conic, marked by strong axial riblets and spiral threads. Operculum flat, with the calcified lamellae reflected to parallel the basal plate. Lamellae marked by strong retractively slanting riblets.

Type of the subgenus.—Diplopoma architectonicum (Gundlach) Pfeiffer.

The following species are now referred to this subgenus. They fall into two groups, as follows:

The group of *Diplopoma retrorsus:*

Cyclostoma retrorsus C. B. Adams	Jamaica.
Cyclostoma moussonianum C. B. Adams	Jamaica.
Cyclostoma radiosum Morelet	Guatemala.

The group of *Diplopoma architectonicum:*

Diplopoma architectonicum (Gundlach) Pfeiffer..................Eastern Cuba.
Diplopoma torrei Ramsden....................................Eastern Cuba.

Subgenus JAMAICIA C. B. Adams.

1850. *Jamaicia* C. B. Adams, Contrib. Conch., p. 88.

Shell almost turbinate, marked by strong axial riblets and spiral threads. Operculum convex, the reflected lamellae marked by strong retractively slanting riblets.

Type of the subgenus.—Cyclostoma anomala C. B. Adams.

The type species is the only one known of this group at present. It comes from Jamaica.

The descriptions of the following species are necessary in order to give status to the groups which they represent and which are referred to in the preceding pages.

PARACHONDRIA (PARACHONDRIA) GONAVICOLA, new species.

Shell elongate-ovate, ashy gray. Early whorls decollated. The three and a half remaining in the type are well rounded and crossed by numerous slender, retractively slanting, axial riblets, which are decidedly crowded on the last turn. These riblets are gathered together as tufts at the summit of the whorls, and render the suture denticulate. The spiral sculpture consists of numerous slender low rounded threads, which render the axial riblets wavy and very slightly nodulose. Periphery of the last whorl well rounded. Base somewhat inflated, well rounded, narrowly umbilicated, marked like the spire, excepting the umbilicus, in which the spiral sculpture is intensified. The last whorl is solute for an eighth of a turn. Aperture ovate; posterior angle acute, continuing backward as a nodulose keel to where the whorl becomes appressed to the preceding turn. Peristome not expanded but somewhat thickened. Operculum typically Parachondroid.

Type.—Cat. No. 314944, U. S. N. M., and thirty-three specimens, were collected by Dr. W. L. Abbott on Gonave Island, Haiti. The type measures: Length, 15.4 mm.; greater diameter, 10.4 mm.; lesser diameter, 9 mm.; length of aperture, 7.1 mm.; diameter of aperture, 5.2 mm.

This species is related to *Parachondria* (*Parachondria*) *dentilobata*, Weinland, but is uniformly much smaller than that species.

TORRELLA (TORRELLISCA) SIMPSONI, new species.

The shell is elongate-conic, decollated, leaving four and a quarter well rounded whorls, the last being solute for a short distance, and obtusely carinated along its posterior angle. The shell is narrowly umbilicated and open at the truncated apex, leaving a hollow axis.

The color is ashy white without color markings of any sort. The sculpture consists of sublamellar riblets which are more widely spaced on the upper whorls and more or less unevenly spaced on all the whorls. Some of these riblets project above the rather deeply impressed suture in thin, somewhat flexuous lamellae, sometimes touching a riblet of the whorl above, and giving the appearance of a continuous riblet crossing the suture. The spiral sculpture is confined to several nodulose cords within the umbilicus. The aperture is vertical and subcircular, the inner peritreme of the peristome is not projecting; the outer peritreme is moderately expanded throughout, slightly more so in its outer portion and in the lower inner portion slightly fluted or showing a tendency in some specimens to fimbriation. The surface of the expanded outer peritreme is coarsely concentrically laminated. Just within the aperture near the posterior margin is a breathing pore which communicates with a prominent siphon without, which projects upward and then curves inward and downward almost to touch the preceding whorl; the siphon presents a coarsely ribbed surface.

The operculum is typical of the genus.

Type.—Cat. No. 314942, U. S. N. M., measures: Length, 7.8 mm.; major diameter, 4 mm.; minor diameter, 3.8 mm.; length of aperture within peristome, 1.75 mm.

The type is selected from a large number of specimens collected by Charles T. Simpson and J. B. Henderson at the Soledad plantation at Cienfuegos, in the Santa Clara Province, Cuba.

No notable variation is observable throughout the large series of specimens. The opercular characters remove this species from *Rhytidopoma*, to the members of which genus this shell bears a strong resemblance in its general facies.

TUDORA (TUDORA) ABBOTTI, new species.

The shell is elongate-conic, with seven whorls including the apex, the last nonsolute, openly umbilicated. The color is yellowish straw and further ornamented by 8 to 10 chestnut-colored interrupted spiral bands. On the last two whorls these bands are arranged in both axial and spiral series. The extreme tip is chestnut, the other nuclear whorls being of lighter color. The nuclear whorls are smooth; the postnuclear turns are marked by well-rounded, retractively curved axial riblets, some of which at irregular intervals become thickened at the summit, where they sometimes fuse with neighboring riblets, thus forming an irregularly denticulated suture. The spiral sculpture consists of feeble, low, rounded cords, of which there are 20 between the summit and the periphery on the last turn. These cords render the axial riblets feebly tuberculated at their intersections. The base is marked like the spire, but in the umbilicus the axial sculpture becomes reduced and the spiral intensified. Aperture broadly oval, showing the external color markings within. Peristome double, the outer moderately broadly expanded and somewhat wavy, the inner but slightly expanded, reflected over and appressed to the outer. They both carry the color markings of the outer surface. The operculum is typical Tudorid.

Type and thirteen specimens.—Cat. No. 218044, U. S. N. M., were collected by Dr. W. L. Abbott at Trou de Bon Dieu, Port de Paix, Haiti. The type measures: Length, 14.8 mm.; major diameter, 7.8 mm.; minor diameter, 6.8 mm.; altitude of aperture, 6 mm.; width of aperture, 5 mm.

EUTUDORA (EUTUDOROPS) AZUCARENSIS, new species.

The shell is ovate, pale brown, early whorls decollated. The three and a half remaining in the type are crossed by numerous sublamellar axial riblets which are decidedly expanded at the summit, where they project conspicuously above the suture. These riblets are separated by spaces about as wide as the riblets; on the early whorls, however, there are irregular interruptions in the even spacing of them so that smooth spaces occur in places between the lamella. There are five broad, low, rounded spiral cords, the first of which is about three times as far from the summit as it is from its neighbor. The spiral cords render the axial riblets slightly tuberculated and wavy at their intersections. Base well rounded, marked by five spiral cords which increase regularly in strength from the periphery to the umbilicus. These cords render the axial riblets, which extend to the umbilicus, wavy and slightly nodulose. Aperture subcircular; outer peristome broadly expanded, notched on the upper lip and bent inward to seal the umbilicus, covering the parietal wall with a broad callus. Inner peristome reflected over and almost fused with the outer. A breathing-pore punctures the parietal wall a little behind the peristome at the posterior angle of the aperture.

Operculum typically Tudorid.

Type and ten specimens.—Cat. No. 314943, U. S. N. M., were collected on the *Tomas Barrera* Expedition at Pan de Azucar, Cuba.

The type measures: Length, 7 mm.; greater diameter, 7 mm.; lesser diameter, 6.2 mm.; length of aperture, 5 mm.; width of aperture 5 mm.

DESCRIPTIONS OF SOME PLEISTOCENE VERTEBRATES FOUND IN THE UNITED STATES.

By Oliver P. Hay.
Associate of the Carnegie Institution of Washington.

In the following paper the writer describes the materials found in six collections of fossil vertebrates. Most of these collections were made many years ago and have lain in various museums unstudied. Two collections came from eastern Tennessee, one of them from Rogersville, Hawkins County, the other from Whitesburg, Hamblen County. A third collection was made at Cavetown, Washington County, Maryland, by Dr. Charles Peabody and Mr. Warren K. Moorehead, of the department of archaeology in Phillips Academy, Andover, Massachusetts. The fourth collection is one that was gathered from the loess at Alton, Illinois, some time before 1883, by Hon. William McAdams, of the city named. The fifth collection is that obtained in a sulphur spring near Afton, Oklahoma, by Prof. W. H. Holmes, head curator of anthropology in the United States National Museum. A few of the larger species of this collection have been described by Dr. F. A. Lucas, in papers of several years ago. The sixth collection was made in 1915 for the writer, from a cave situated near the village of Bulverde, Bexar County, Texas, and is now the property of the United States National Museum. It will be seen that the localities are scattered over a wide range of country, and, as a consequence, the collections furnish a considerable variety of species. So far as the writer can determine they consist mostly of animals that lived at about the middle of the Pleistocene period. Most of the remains found in the spring at Afton, Oklahoma, are regarded as belonging to animals that lived during the Aftonian interglacial stage, but it is not unlikely that others got buried there at later times, some possibly near or in the Recent.

1. COLLECTION FROM NEAR ROGERSVILLE, HAWKINS COUNTY, TENNESSEE.

This collection consists of a few bones and teeth which were sent to the Smithsonian Institution in 1887, by Mr. James W. Rogan, of Rogersville. They were reported as having been found in the marble

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quarry of Messrs. Hounshell, Pierce & Co., situated a little more than 1 mile north of Rogersville. The fossils are all of Pleistocene age and they were doubtless buried in crevices in the marble. The matrix that is attached to some of the bones is the red earth characteristic of cave deposits. Only two species are recognized, *Equus leidyi* and *Platygonus setiger*, a species regarded as new.

Family EQUIDAE.

EQUUS LEIDYI Hay.

A single tooth of a horse accompanies the collection—an upper right first or second true molar. Its antero-posterior diameter is 26 mm. its width 24 mm. It has the catalogue number 520 of the United States National Museum.

Family TAYASSUIDAE.

PLATYGONUS SETIGER, new species.

Plate 3, figs. 21–23.

Type specimen.—A lower right canine, with most of the crown missing. Cat. No. 519, U.S.N.M.

Type locality.—Hawkins County, Tennessee.

Type formation.—Pleistocene.

Diagnosis.—A large species. Section of crown at base a nearly equilateral triangle. The outer face convex, with broad low ridges on the outer face of the crown. Inner face with a groove along the middle of the width and with a ridge in front and behind the groove. Root with longitudinal grooves and ridges on each lateral face; the hinder face occupied by one broad deep groove.

There is in the collection from Rogersville a part of a large lower left canine (Cat. No. 519) of a peccary, which is here named *Platygonus setiger* (pl. 3, figs. 21–23). Nearly the whole of the crown is missing, but the freshness of the break indicates that the collector did not preserve the missing part. Also a little of the extremity of the root is broken away. The length of the portion of the tooth preserved, measured along the anterior border, is 114 mm. Evidently the tooth belonged to a fully grown, but not aged, individual. The curvature is about the same as in *Platygonus compressus*. The section of the crown at the break is triangular. The inner face is flat and 14 mm. wide; the hinder face, slightly concave (due partly to wear against the upper tooth) and 15 mm. wide; the outer face, convex and 18.5 mm. wide. The front of the tooth presented a subacute edge. The hinder face of the root has a broad channel throughout its length. The inner face is flat, rounding off behind into the hinder face. All of the faces are grooved and ridged. The writer has described a crown of a lower canine of a large peccary[1] as *Mylohyus? temerarius.* This crown, however, was broadly rounded in front, and therefore quite different from the tooth from Rogersville.

The limb bones of a peccary from Rogersville are referred provisionally to this species. They consist of a left humerus, lacking the upper end; a shaft of a right humerus; a left radius, lacking the distal end; a right astragalus; and the distal end of a metapodial, lacking the epiphysis. These have the catalogue number 518. The humerus lacks the upper end down to where the ridge ascending to the ulnar tuberosity leaves the deltoid ridge. The distance from the extreme end of the inner condyle to the surface of the head must have been not far from 190 mm. The deltoid ridge is sharp. The humerus, at its upper end, as preserved, has an antero-posterior diameter of 42 mm.; the shorter 20 mm. At the middle of the presumed original length the longer diameter is 28 mm.; the shorter 22 mm. The width of the articular surface for the forearm is 37 mm.; the fore-and-aft width of the inner condyle, 48 mm. These dimensions are not greatly different from those obtained from humeri of skeletons of *Platygonus compressus* found at Columbus, Ohio, and now in Yale University.

The radius fits accurately to the humerus just described. The length down to the epiphysial surface is 134 mm. The original length must have been close to 148 mm. The width at the upper articulation is 31 mm.; the greatest diameter at the middle of the length, 19 mm. The bone is nearly straight, not bent as in the existing peccary.

2. COLLECTION MADE NEAR WHITESBURG, TENN.

The collection below described appears, from correspondence in the office of correspondence and documents in the United States National Museum, to have been made in 1885 by Ira Sayles, who was then a collector for the United States Geological Survey. The only record regarding the locality is found written in pencil on the bottom of a paper tray which was with the collection. It runs thus: "One mile north of Whitesburg, Hamblen Co., Tenn., in a kind of koechenmiddens. Probably an old fortification. Sayles." From the correspondence referred to above it is shown that in 1885 Sayles sent a collection of shells from Strawberry Plains, in the next county west of Hamblen.

With the collection are some chunks of the matrix which contained the fossils. This proves to be the red earth which forms in the bottom of caves. These pieces of matrix are crowded with fragments of bones. The earthy material is reddish brown in color.

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[1] Iowa Geol. Surv., vol. 23, p. 227, pl. 21, figs. 1, 2.

Evidently the cave is no longer in existence, having probably been eroded away, while its floor was in some way protected from erosion. The following species have been determined in the collection. Those marked with a dagger are extinct.

†*Testudo munda*, new species.
†*Equus leidyi.*
†*Equus littoralis.*
†*Tapirus tennesseae*, new species.
†*Mylohyus nasutus.*
Odocoileus virginianus.
†*Sangamona fugitiva*, new genus and species.
Cervus canadensis.
†*Elephas primigenius.*
Sciurus hudsonicus.
S. carolinensis.
Tamias striatus.
Marmota monax.
Castor canadensis.
Neotoma pennsylvanica.
Microtus pennsylvanicus.
Lepus americanus.
Ursus floridanus.
Procyon lotor.
†*Aenocyon ayersi?*

Twenty species are determined, of which eight are extinct. Possibly materials that are referred to existing species would, if better represented, prove to belong to extinct forms; but they would, at least, be closely related to those recognized.

Family TESTUDINIDAE.

TESTUDO MUNDA, new species.

Plate 3, figs. 1–3.

Type specimen.—Fragments of carapace and plastron. Cat. No. 8944, U.S.N.M.

Type locality.—Whitesburg, Hamblen County, Tennessee.

Type formation.—Pleistocene.

Diagnosis.—A species rather small for the genus. Seventh peripheral with border thickened and recurved; the ninth with border slightly recurved; the marginal scutes not extending to its upper border; plastron thick at center of hinder lobe.

Among the materials from Whitesburg are fragments of both the carapace and the plastron of a tortoise which appears to have belonged to the genus *Testudo*. The principal pieces are illustrated on plate 3. The elements present are part of the left second peripheral; the right first rib plate; the right seventh peripheral; the right ninth peripheral; a fragment of a rib, probably the seventh; a piece of the left hyoplastral bone; a part of both hypoplastrals, coming to the midline; and a piece of each of the xiphiplastrals, meeting at the midline. In the United States National Museum these bones have the catalogue number 8944. These bones show that the animal had a rather thick and heavy shell. The length of the carapace is estimated to have been not far from 135 mm.

The left second peripheral (pl. 3, fig. 1) lacks its inner half. The length along the free border is 17 mm.; the greatest thickness of the bone is 7 mm. The bone is only slightly recurved upward. The right seventh peripheral (pl. 3, fig. 2) is 18 mm. long and 15 mm. high. Its upper and anterior corner is broken off. Seen from within, the anterior part is occupied by a part of the sternal chamber. The anterior part presents the buttress which rose to meet the sixth rib. A part of the buttress is split off, but there is left a pit for the distal end of the rib. The edge which articulated with the hypoplastron is thin and sharp, so that the union of the two bones appears to have been weak, at this point at any rate. The right ninth peripheral is intact. It is 14.5 mm. long, 16 mm. high, 5.5 mm. thick in front and a little thinner behind.

The right first costal plate lacks about the distal half. It is 21 mm. wide. The proximal end is occupied by parts of the first and second vertebral scutes. The other rib fragment by its narrowness appears to indicate the usual alternation of wide and narrow costals. The elements of the hypoplastron appear to have come forward nearly to the hyohypoplastral suture. It is believed that the bone on the right side (left of the figure) reached the suture mentioned. As shown by the figure (pl. 3, fig. 3) there is a fragment of the xiphiplastron which belonged to the free border, but just how near it approached the remainder of the xiphiplastral is uncertain. The plastron is about 9 mm. thick at the crossing of the hypoxiphiplastral suture and the median one; but it thins rapidly in all directions. The lower surface of the hypoplastron presents ridges and grooves due to the growth of the horny plates. The greater part of the surface of the carapace is smooth, but a fragment of one peripheral displays ornamentation.

Family EQUIDAE.

EQUUS LEIDYI Hay.

In the Whitesburg collection there is an upper right second premolar of a horse which is referred to this species (U. S. Nat. Mus. No. 8945). It is worn down to about one-half of its original length, and the anterior style is broken off. The height of the crown is 42 mm.; the width across the worn face at the posterior outer style, 25 mm. The length of the grinding surface was probably close to 35 mm. When compared with a corresponding tooth of *Equus complicatus*, from the region about Charleston, South Carolina, the Whitesburg tooth is seen to be considerably smaller. There is present also a part of an uncut milk molar of a horse, probably *E. leidyi* (Cat. No. 8946).

EQUUS LITTORALIS Hay.

In the collection there is a lower tooth of the right side of the jaw of a small horse (Cat. No. 8947). The crown is worn down nearly to the base, the height being only 17 mm. and the roots are absorbed. The length of the crown is 22 mm.; the width in front, 13 mm.; at the rear, 11.5 mm. The outer median valley is pushed inward between the contiguous ends of the two inner valleys. The small size of this tooth makes it probable that it belonged to *Equus littoralis*, being too small for either *E. complicatus* or *E. leidyi.*

There are two incisors of a colt, which, on account of the small size as compared with those of the young of the domestic horse, are referred to *E. littoralis* (Cat. No. 8948). They are very little worn. The larger has the crown 17 mm. high on the front face, 20 mm. wide at the cutting edge, and 11 mm. wide at the base. The smaller is somewhat more worn, is 13 mm. high, 16 mm. wide on the cutting edge, and 10 mm. at the base. The roots of both teeth have been gnawed off by rodents.

Family TAPIRIDAE.

TAPIRUS TENNESSEAE, new species.

Plate 3, figs. 4–11.

Type specimen.—Ten teeth, Cat. No. 8949, U.S.N.M.

Type locality.—Whitesburg, Hamblen County, Tennessee.

Type formation.—Pleistocene.

Diagnosis.—Size probably smaller than in *T. terrestris.* Parastyle feeble, no tubercles at ends of valleys of lower teeth.

In the collection are 10 teeth, which belonged to a young tapir. These consist (as the writer identifies them) of an incisor; a right third upper premolar, showing extremely little wear, having a large pulp cavity and no roots; the front lobe of the right fourth premolar, slightly worn; the hinder lobe of the upper left first molar, with a band of attrition on the front of the transverse ridge; a nearly complete crown of the upper right second molar, with the anterior border gone, having a large pulp cavity and slight wear; the lower left second premolar, slightly worn and injured; the lower right third premolar, touched slightly by attrition; the right fourth premolar which had not yet been cut; the lower right second molar, without roots, with a large pulp cavity, and some wear on hinder faces of the ridges; the front lobe of the corresponding tooth of the left side; and the as yet uncut lower left hindermost molar. They have the catalogue number 8949. These have been compared closely with the corresponding teeth of a specimen of *Tapirus terrestris*, from Guatemala (No. 61221 of the United States National Museum) and with the teeth of *Tapirus veroensis*, as described by Sellards.[1] The following measurements are presented. The figures in parentheses represent the widths of the hinder lobe of the first upper molar of the three species.

MEASUREMENTS OF TEETH OF TAPIRS IN MILLIMETERS.

	Upper teeth.			Lower teeth.		
	T. terrestris.	*T. veroensis.*	*T. tennesseae.*	*T. terrestris.*	*T. veroensis.*	*T. tennesseae.*
Second premolar:						
Length	18	18.5	....	22.5	....	21
Width	18.5	23	....	11.5	....	....
Third premolar:						
Length	21	19	19	21	....	22.5
Width	23	24	20	14.5	....	17
Fourth premolar:						
Length	19.5	20	....	21	....	20
Width	24.5	26	22.5	16.5	....	17
First molar:						
Length	21	21.9	....	21.5	23	....
Width	22 (20)	26(16.7)	(22.5)	16	18	....
Second molar:						
Length	23	24	....	23.5	....	25
Width	25.5	28	26	17.5	....	19.2
Third molar:						
Length	22	25	....	24	....	22.5
Width	24	29.3	....	17	....	20

It will be observed that all of the upper teeth of the Tennessee specimen are smaller than the corresponding ones of *T. veroensis;* we may hence conclude that they probably belonged to a smaller species. One of the striking characters of the upper teeth of Sellards' species is the size of the parastyle, this being nearly as large as the paracone. In the case of the teeth here described the parastyle is relatively weak. There appears to have been no exterior cingulum in the upper teeth; nor is there any tubercle between the paracone and the metacone. Likewise the inner tubercle is weak in the Tennessee teeth, but large in *T. veroensis.* The ridge which descends from the summit of the paracone to the bottom of the median valley appears to be considerably weaker than it is in *T. veroensis.* It seems to be safe to regard the tapir under consideration as distinct from *T. veroensis.*

Excepting the second molar, of which only the front border is missing (pl. 3, fig. 5), the upper teeth are all smaller than the corresponding ones of *T. terrestris.* On the other hand, the most of the lower teeth are somewhat larger. The second lower premolar (pl. 3, fig. 6), is shorter than in *T. terrestris*, but its hinder lobe is damaged. At the middle of this tooth the thickness is 12 mm.; in

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[1] Tenth and Eleventh Ann. Rep. Fla. Geol. Surv., 1918, p. 57, pls. 1–4.

T. terrestris it is only 10.5 mm. In the lower teeth of the last-named species there is a tubercle at both ends of the transverse valley; in *T. tennesseae* the tubercles are wholly missing. On the plate quoted (figure 4) is the upper right third premolar. Its greatest length is 20 mm.; its width, 19.5 mm. Figure 7 represents the lower right third premolar. Its length is 22.5 mm.; its width, 17 mm. The tooth of figure 8, the lower right fourth premolar, is 20 mm. long and 17 mm. wide. A fragment is missing from the inner border in front. Figure 9 is taken to be the lower right second molar; length, 25 mm.; width, 19.2 mm.

The parastyle of the upper teeth of *T. terrestris* is more strongly developed than in the Tennessee tapir, as well as the ridge descending from the summit of the paracone. Evidently, also, the hinder transverse ridge is set farther forward in *T. tennesseae* than in *T. terrestris*, so that the postfossette is larger. The position of the incisor (pl. 3, fig. 11) has not been determined. Its crown is 12 mm. wide and 11.5 mm. from front to rear at the base, 8 mm. from front to rear of the hinder cusp, and 11 mm. high in front. *Tapirus haysii*, as represented by its teeth, was a much larger species.

Family TAYASSUIDAE.

MYLOHYUS NASUTUS Leidy.

Plate 3, figs. 12–13.

This species appears to be represented by three upper canines (Cat. Nos 8950–2, U.S.N.M.). Two of the canines are here figured (pl. 3, figs. 12, 13). These are quite different in size, but the smaller one may have belonged to a female. All of the teeth are worn, not only in front, but also near the tip, on the outer or more convex face. The large tooth has a diameter of 15 mm. at the base of the crown and a thickness of 10 mm. The inner face is nearly flat; the outer convex. Evidently the front border was broadly rounded, but the hinder border forms a sharp edge. Both lateral faces are furnished with grooves and ridges, the inner with about 8, the outer with about 10 ridges. The ridges are sharper and more distinct than in *Platygonus compressus*. This sculpture of the teeth is well shown in Leidy's figure of the type of the species.[1] From that figure it will be seen that the upper canine is strongly curved. That of *P. compressus* is not so much curved.

Family CERVIDAE.

ODOCOILEUS VIRGINIANUS (Zimmermann).

This species appears to represented by 5 upper molars, 15 lower molars, and 1 right first incisor. No premolars are present.

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[1] Journ. Acad. Nat. Sci., Phila., vol. 8, 1869, p. 385, pl. 28, figs. 1, 2.

To these teeth are given the catalogue number 8953. The most striking character of some of the teeth is the small size as compared with those of most specimens of *O. virginianus*. A lower last molar is hardly 18 mm. long; a lower first molar, 13 mm. long. The upper molars are furnished with a well-developed tubercle at the mouth of the inner valley; the lower ones each with a tubercle at the mouth of the outer valley.

SANGAMONA, new genus.

Type species.—*Sangamona fugitiva*, new species.

Type locality.—Eastern Tennessee.

Type formation.—Pleistocene.

Diagnosis.—Upper molars of medium height, broad. Outer face of anterior lobe with a feebly developed style; the outer face of the hinder lobe deeply concave and devoid of style. Lower molars relatively broad; inner faces of front and hinder lobes flat and with feebly developed styles.

This genus differs much from our other deer in the nearly complete absence of the strong ribs which occupy the outer faces of the lobes of the upper molars. If, as is supposed, the lower molars found in the loess at Alton, Illinois, belong to the same genus, the lower molars also differ from those of our other deer in having the styles on the inner faces of the lobes feebly developed. The teeth resembling most those here described are found in *Dama dama;* but here too, the style of the upper front lobe is stronger, and the outer face of the hinder lobe is not so deeply excavated; while the lower styles are well expressed.

The generic name is given in allusion to the Sangamon stage of the Pleistocene, during which this large deer is supposed to have lived.

SANGAMONA FUGITIVA, new species.

Plate 3, figs. 14–15.

Type specimen.—An upper left second molar (Cat. No. 8954, U.S.N.M.)

Type locality.—Whitesburg, Hamblen county, Tennessee.

Type formation.—Pleistocene.

Diagnosis.—Styles, or ribs, on paracone and metacone absent or obsolete. Size intermediate between the Virginian deer and the wapiti.

This supposed new species is based primarily on a single upper cheek tooth, taken to be a second true molar of the left side (pl. 3, figs. 14, 15). It is worn down moderately. The greatest length at the outer border of the crown is 20 mm., at the base 16 mm.; width at the base of the front lobe, 22 mm.; at the base of the hinder lobe, 20.5 mm. In the case of the first molar of *Cervus canadensis* the length at the base of the crown is 21 mm.; the width, 26 mm. The fossil tooth differs from the cheek teeth of *Cervus canadensis* and *Odocoileus virginianus* in the almost complete absence of the median ribs on the outer faces of the anterior and posterior lobes. In both of the species named these ribs, especially the anterior one, are very prominent.

CERVUS CANADENSIS Erxleben.

In the collection from Whitesburg there is a fragment of an upper left molar which appears to belong to this species (Cat. No. 8555). This fragment consists of the outer wall of the paracone. The ridge which descends on the middle of the outer face of this part of the tooth in this species is well developed. Another fragment of a lower molar (Cat. No. 8556), belonging possibly to the same species, is not so satisfactorily determined.

Family ELEPHANTIDAE.

ELEPHAS PRIMIGENIUS Blumenbach.

Plate 3, fig. 16.

In the collection from Whitesburg there is found the rear of a second milk molar, probably a lower one (pl. 3, fig. 16). There are present only one ridge plate and the talon. On geographical grounds one would conclude that the tooth belonged to *Elephas columbi*. However, the plate is remarkably small. From side to side the width is only 26 mm.; the height also, close to 26 mm. Its small size indicates a tooth of the southern form of *E. primigenius*. Inasmuch as the latter species has been recognized as far south as Beaufort, North Carolina, and in Texas, it might, perhaps during a Pleistocene glacial stage, have peopled the mountain regions of eastern Tennessee. The specimen has the catalogue number 8957.

Family SCIURIDAE.

SCIURUS HUDSONICUS (Erxleben).

The writer has found a single upper right incisor which he refers to this squirrel. It is very slightly smaller than in recent specimens that have been examined, but further search would probably bring to light recent teeth as small. The catalogue number is 8958.

SCIURUS CAROLINENSIS Gmelin.

This species appears to be represented by an upper left (Cat. No. 8959) and a lower right (Cat. No. 8960) incisor. While resembling closely the teeth of recent specimens these fossil teeth are thinner. However, a specimen of *S. carolinensis extimus*, from Osceola County, Florida, No. 111394 of the United States National Museum, appears to have incisors not perceptibly different from those from Whitesburg.

TAMIAS STRIATUS (Linnaeus).

Of this species there is present only a single tooth, a lower right incisor (Cat. No. 8961). On comparison with the corresponding tooth of a recent specimen it appears to be slightly larger.

MARMOTA MONAX (Linnaeus).

Of this species there have been preserved an upper left incisor (Cat. No. 8962) complete; the distal half of the lower left incisor (Cat. No. 8963); the left humerus (Cat. No. 8964), lacking the head; and the left femur (Cat. No. 8965), lacking the distal end. No important differences are observed on comparison with the corresponding parts of a recent skeleton.

Family CASTORIDAE.

CASTOR CANADENSIS Kuhl.

This species is represented by 10 grinding teeth (Cat. No. 8966) and a fragment of the right ramus of a lower jaw (Cat. No. 8967). These parts are not distinguishable from the corresponding ones of the existing beaver.

Family CRICETIDAE.

NEOTOMA PENNSYLVANICA Stone.

Of the Pennsylvania wood rat there are present six lower incisors, one upper incisor, and a lower first molar. To these have been given the catalogue number 8968. Some of the incisors are slender, but Dr. E. A. Goldman, who has given especial attention to the species of this genus[1], gives the assurance that all of the teeth belong to *N. pennsylvanica.* The writer is of the opinion that this species may prove to be identical with Baird's *N. magister.*

MICROTUS PENNSYLVANICUS (Ord).

A lower left incisor and a lower left first molar (Cat. No. 8969) belonging to this collection are referred to this species. The incisor is rather slender, but it may have belonged to a young individual.

Family LEPORIDAE.

LEPUS AMERICANUS Erxleben.

In the Whitesburg collection are six lower jaws or parts thereof (Cat. Nos. 8970–8975), five of them with teeth; two fragments of left maxillae with teeth, and one of the left side without (Cat. Nos. 8976–8978); a premaxilla with an incisor (Cat. No. 8979); 12 vertebrae, mostly lumbars (Cat. No. 8981); two sacra; five damaged ossa innominata; and many limb bones, mostly broken. Some of these bones belong possibly to another species, as yet undetermined.

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[1] North American Fauna, No. 31.

In studying the teeth and the parts of the skull at hand comparisons have been made with many skulls in the collection of the United States National Museum. No differences are found in either the size or the structure of the teeth. The front end of the zygoma of the fossil appears to be rather broader and smoother than in *L. americanus virginianus.* The lower jaw seems to be more massive than in the species just named. Also, the distance between the tooth row and the hinder face of the incisor in the fossil appears to be greater relatively to the tooth row, and the jaw deeper, than in most large specimens of the recent skulls; but specimens of the latter are met with which appear to bridge over the differences.

According to G. S. Miller[1] the subspecies *virginianus* extends its range southward into the mountains of West Virginia and Virginia. It is possible that the Whitesburg remains belong to a distinct subspecies of *L. americanus*, or even to a distinct species.

URSUS FLORIDANUS C. H. Merriam.

Plate 3, figs. 17–20.

In the Whitesburg collection are several teeth and a much-gnawed fragment of a right ramus of the lower jaw (Cat. No. 8992) of a bear which on comparison with specimens in the United States National Museum are referred to *Ursus floridanus.* One tooth is a lower right third incisor (Cat. No. 8993), the breadth of which is 7.5 mm. An upper right canine (Cat. No. 8994) had been worn down nearly to the base of the crown. The root is flat and measures 22 mm. from front to rear and 12 mm. transversely at the hinder border. Crowns of two other upper, little worn, canines are present (Cat. Nos. 8993, 8995). Of two lower right first molars (Cat. Nos. 8993, 8995), one (pl. 3, fig. 17) is little worn, and presents both roots. The other offers only the front end of the enamel cap of an uncut tooth. The first of these molars is 22 mm. long and 14 mm. wide. A first molar of the left side (pl. 3, fig. 18) is 22.5 mm. long and 14 mm. wide. Two upper left hindermost molars (Cat. Nos. 8993, 8995) had not yet come into use and the hinder edge of each is missing, apparently gnawed off by rodents. The length of No. 8993 (pl. 3, fig. 19) was close to 27 mm.; the width in front 16.4 mm. In a recent tooth of this species the length is 27 mm.; the width 15 mm. In the other upper hindermost tooth (Cat. No. 8995; pl. 3, fig. 20) the preserved length is 24 mm.; the width is 15 mm. Besides the lower incisor tooth mentioned there are present, of lower teeth, the hinder end of the right first molar (Cat. No. 8993); the right and the left second molars (Cat. No. 8993), with roots; and two hindermost molars, a right and a left, of individuals of somewhat different ages. The length of each is close to 17 mm., the width 13.3 mm.

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[1] Bull. 79, U. S. Nat. Mus., 1912, p. 348.

Family PROCYONIDAE.

PROCYON LOTOR (Linnaeus).

This species is represented in the collection by a lower left second molar (Cat. No. 8996).

Family CANIDAE.

AENOCYON AYERSI? Sellards.

Plate 4, figs. 24–26.

There are present in the collection some teeth (Cat. No. 8997) of a large wolf which is referred with some doubt to this species. The teeth are the upper third premolars, right and left; the upper right second premolar; the upper left first premolar; the lower right second premolar, with the front root and part of the crown missing; the upper first and the lower left third incisors. The teeth are practically unworn. The upper third premolars (pl. 4, figs. 24, 26) are 17 mm. long, 7.6 mm. thick. In these measurements they agree exactly with those of the type of *A. ayersi*. In a specimen of *A. dirus* at hand a tooth having the same length has a thickness of slightly less than 8 mm. The cingulum of the Whitesburg tooth is more strongly developed than in the specimen of *A. dirus*.

The upper second premolar (pl. 4, fig. 25) is 16.2 mm. long and 7.5 mm. thick, being thus as long as in *A. dirus*, as reported by Sellards, and longer than in the type of *A. ayersi*. In the *A. dirus* skull at hand the length is 14 mm.; the thickness, 7.8 mm. This tooth differs from the corresponding one of *A. dirus* and that of *Canis nubilus* in having the sharp anterior edge of the cusp continue nearly straight forward to the cingulum, instead of curving strongly inward to meet the latter. The first upper premolar resembles that of *Canis nubilus*, but is larger. The length of the crown is 8.4 mm.: the thickness, 6 mm. The lower second premolar has a thickness of 6.6 mm. The rear portion is furnished externally and internally with a pretty strong cingulum. Behind the cusp there is a tubercle about as large as in the third premolar. From the latter it differs in being lower and thinner.

The upper third incisor resembles that of *Canis nubilus*, but it is larger. The greatest width of the crown is 8 mm.; the thickness of the base, fore and aft, is 7.5 mm.; the upper second incisor measures 7 mm. across the accessory cusps.

3. COLLECTION FROM CAVETOWN, MARYLAND.

In 1908 [1] Dr. Charles Peabody published a paper on the Exploration of Bushey Cavern, near Cavetown, Maryland. This village is situated in Washington County, about 8 miles east of Hagerstown. In the account Dr. Peabody mentioned the fact that immediately south of the cavern was a large limestone quarry. On page 12 he stated that in the red earth of this quarry were observed many fossilized or semifossilized animal bones, and that among these was one which had been identified as probably *Equus complicatus.*

The bones which were collected have been sent to the writer for study. They are much fractured and scattered, but are well fossilized. The following species have been identified. Those preceded by the dagger are extinct.

LIST OF SPECIES.

Crotalus horridus.
†*Equus complicatus.*
†*Equus giganteus?*
†*Mylohyus nasutus.*
†*M. exortivus.*
†*M. obtusidens*, new species.
†*Platygonus tetragonus?*
†*P. vetus?*
†*P. cumberlandensis.*
†*Sangamona fugitiva.*
Odocoileus virginianus.
†*Elephas columbi?*
†*Sciurus tenuidens*, new species.
S. hudsonicus.
S. carolinensis.
Marmota monax.
Castor canadensis.
Ondatra zibethica.
Neotoma magister.
Microtus pennsylvanicus.
Erethizon dorsatum.
Sylvilagus floridanus.
Ursus americanus.
†*Smilodontopsis mooreheadi*, new species.
Felis couguar.

Of the 25 species of this list it will be observed that 12 are extinct. This large percentage of species no longer in existence and the geological history of some of them, as the horses, the peccaries, and the saber-tooth tigers, indicate that the time of their existence was somewhere about the middle of the Pleistocene.

Through the liberality of the Board of Trustees of Phillips Academy this collection has become the property of the United States National Museum.

Family CROTALIDAE.

CROTALUS HORRIDUS Linnaeus.

In the collection from Cavetown there are two crotalid vertebrae which appear to be identical with vertebrae of *Crotalus horridus.* The catalogue number is 9157.

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[1] Bull. 4, Archaeol. Phillips Acad., pp. 1–2.

Family EQUIDAE.

EQUUS COMPLICATUS Leidy.

One tooth and several fragments of bones are referred to this species. A milk molar of the upper jaw, with the inner half split off, is in the lot (Cat. No. 9158). It had just begun to be used. The width at the summit is 34 mm.; but at the base, 30 mm. A piece of the upper end of a tibia, 5 inches long is eroded and somewhat crushed. A fragment of the lower end of a tibia about 100 mm. long, has been much gnawed by rodents. The two fragments probably belong together. There are also one first phalanx, lacking a part of the distal end; a nearly complete second phalanx and fragments of two others; also a pisiform bone. These have belonged to a very large horse. The tibia measures 47 mm. across the hinder face; that of a recent horse of medium size measures 40 mm. at the same place. The first phalanx measures across the proximal end 55 mm. These bones have the catalogue numbers 9159–9163.

Some years ago [1] a tooth of a horse that had been found in the red earth of a stone quarry near Cavetown and sent to the United States National Museum for identification was regarded as belonging probably to *Equus complicatus*.

EQUUS GIGANTEUS? Gidley.

Plate 4, fig. 1.

With the Cavetown collection are found two fragments of the upper left second premolar (pl. 4, fig. 1) of a large horse which is referred to this species. The two pieces (Cat. No. 9164) were certainly parts of the same tooth, and they seem to fit together accurately as placed in the figure. This tooth had been worn down to a height of about 20 mm. The hinder part is missing, especially on the outer side; also most of the inner face in front of the protocone.

The type of this species, found in southwestern Texas, is an upper second molar, and it is especially distinguished by its large size, having a length of 40 mm. or more on the grinding surface. As shown by Gidley's figures,[2] the enamel of the fosettes is rather strongly folded. The length of the premolar from Cavetown can only be estimated. This premolar in a large horse (No. 843, U.S.N.M.) is 40 mm. long, and the distance from the rear of the protocone to the front of the anterior fossette is 23 mm. In the Cavetown specimen the latter measurement is at least 29 mm. and may be as much as 33 mm. We may conclude that the whole length was close to 50 mm. The width can not be exactly determined. The distance from the outer anterior style to the inner face of the anterior fossette is 15 mm.; in the domestic horse mentioned it is 12 mm. The greatest width may have been, therefore, 30 mm. or more. The protocone is 11 mm. wide. The valley behind it has no reentrant loop. The anterior fossette is 23 mm. long and differs much from the usual form. There is no reentrant fold opposite the head of the postprotoconal valley. The enamel at the front of the fossette is much folded. Judging from the tooth at hand, one may conclude that the horse here described may have had linear dimensions about one-fourth greater than our large domestic horses, but it may have been actually not so much larger. *Equus complicatus* had the second premolar but little larger than that given above for *E. caballus.*

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[1] Bull. 4, Dept. Archaeol. Phillips Acad., 1908, p. 12.

[2] Bull. Amer. Mus. Nat. Hist., vol. 14, p. 137, fig. 27.

Family TAYASSUIDAE.

MYLOHYUS NASUTUS Leidy.

Plate 4, figs. 2–3.

From Cavetown there come two nearly complete, little worn, lower left canine teeth, which are referred provisionally to this species (pl. 4, figs. 2, 3). The total length of the smaller of these two teeth (Cat. No. 9165), taken along the front border, is 80 mm.; but a little of the tip of the root is missing. The crown (pl. 4, fig. 2), similarly measured, is 26 mm. high. At the base the crown measures fore and aft 10.3 mm.; from side to side, 8 mm. The inner and outer faces are convex, the outer more strongly so. The anterior border is rather obtuse, except near the summit of the crown. The hinder border has a rather acute ridge descending from the summit, but just outside of this there is a shallow groove. As a whole the hinder face is quite different from that of the other peccaries observed. Each lateral face is furnished with about four grooves. The one nearest the front border, on the inner face, is broader than the others. The hinder face is slightly worn in its distal half. A view of the outer face of the tooth is presented.

The larger of the teeth (Cat. No. 9166) measures along the front border 93 mm., of which 45 mm. belongs to the crown (pl. 4, fig. 3). The greater diameter at the base of the crown is 11.5 mm.; the smaller, 9 mm. This tooth does not differ from the other in any important respects.

MYLOHYUS EXORTIVUS Gidley.

Plate 4, figs. 4–13.

This species has been described by Gidley.[1] It is based on a series of upper molars and premolars (lacking pm^2) of the right side, and a lower jaw bearing all of the teeth, including incisors and canines (Cat. No. 8876). These were found in the cave near Corriganville, a few miles north of Cumberland, Maryland. In the collection from Cavetown there is a fragment of the left ramus of a mandible which contains the three molars (Cat. No. 9167). Inasmuch as these are less worn than the teeth of the type, it is thought well to figure them (pl. 4, fig. 4). Measurements are here presented of these teeth and the corresponding ones of the type of the species.

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[1] Proc. U. S. Nat. Mus., vol. 57, p. 676, text figs. 11–13.

MEASUREMENTS OF LOWER MOLARS IN MILLIMETERS.

	M. exortivus, type.	*M. exortivus*, Cavetown.
Length of molar series	50	53
Length of first molar	14	15
Width of first molar	13	13
Length of second molar	15	16
Width of second molar	14	14
Length of third molar	19.5	21
Width of third molar	13	13

As will be observed there is close correspondence in the measurements. There appears to be equally close agreement in the structure of the teeth.

Figure 5 of the plate 4 represents a lower left third premolar (Cat No. 9168), wholly unworn, whose length is 128 mm. and whose width is 11 mm. Figure 6 gives a view of a lower left first molar (Cat. No. 9169), unworn. It is 15.5 mm. long and 13 mm. wide. A lower left second unworn molar (Cat. No. 9170) is shown by figure 7. Its length is 18 mm.; its width 14.2 mm.

Of upper teeth there are those identified as second, third, and fourth premolars (pl. 4, fig. 8) of one individual (Cat. No. 9171). The following comparative measurements are given of the premolars of the figure just cited:

MEASUREMENTS OF UPPER TEETH IN MILLIMETERS.

	M. exortivus, type.	*M. exortivus*, Cavetown.
Premolar 2:		
Length	....	9
Width	....	8.2
Premolar 3:		
Length	10.4	11
Width	11.5	10
Premolar 4:		
Length	12.5	13
Width	13.8	12.8
Molar 1:		
Length	14	14
Width	14	13.2
Molar 2:		
Length	15	16
Width	13.2	14.5

There are also several loose upper teeth which are believed to belong to the same species. Figure 13 (Cat. No. 9172) is from an upper premolar, thought to be the second of the right side. Its length is 10 mm.; its width 9 mm. Figure 9 (Cat. No. 9173) presents a view of an upper right premolar, apparently the fourth; but it is somewhat smaller than that of figure 8. It is but little worn and is 12.5 mm. long and 11.6 mm. wide. Figure 10 (Cat. No. 9174) represents an upper left fourth premolar hardly touched by wear. It is 13.5 mm. long and 13 mm. wide. An upper left first molar (Cat. No. 9175) considerably worn is shown by figure 11. It is 14 mm. long and 14 mm. wide. An upper right second molar (Cat. No. 9176) furnishes figure 12. It is wholly untouched by wear and presents the roots. It is 16 mm. long and 14 mm. wide. Inasmuch as it presents a distinct central tubercle and a slight external cingulum it is possible that it belongs to another species.

MYLOHYUS OBTUSIDENS, new species.

Plate 4, figs. 14–15.

Types or species.—A complete upper canine, and the crown of a lower one (Cat. No. 9186).

Type locality.—Western Maryland.

Type formation.—Pleistocene.

Diagnosis.—Canines, upper and lower, with front and rear borders obtuse. Enamel smooth.

The two canines of the left side (Cat. No. 9186) which are made the type of this supposed new species are considerably worn. It seems probable that they belonged to the same individual, inasmuch as the worn surfaces fit accurately together. The upper canine (pl. 4, fig. 14) presents the tooth in the condition it had when the animal died. The crown has a height of 35 mm. The height of the whole tooth, measured along the anterior border, is 95 mm. At the base of the crown the fore-and-aft diameter is 15 mm.; the side-to-side diameter 11 mm. As far as preserved, the anterior border is broadly rounded, the posterior border somewhat less so. Even toward the tip of the tooth there is no indication of a hinder sharp edge.

The lower canine (pl. 4, fig. 15), broken off at the base of the crown, has there a fore-and-aft diameter of 12 mm., a transverse diameter of 9.6 mm. The front is broadly rounded. On the hinder face there is an indication of a shallow groove; on the outer face a mere trace of a narrow one. The enamel of both canines is smooth and polished.

There is present a fragment, 40 mm. long, of another and smaller lower canine (Cat. No. 9187), which belonged probably to a female. At the base of the crown the fore-and-aft diameter is 10 mm.; the transverse, 8 mm. There is merely a suggestion of a groove on the hinder face.

PLATYGONUS TETRAGONUS? (Cope).

Plate 4, figs. 16–17.

In the Cavetown collection is part of an inferior right canine (Cat. No. 9188) which differs from any found at either Cavetown or Corriganville, near Cumberland. It appears to conform most closely to Cope's description of his *Mylohyus tetragonus*;[1] but the tooth, as did Cope's species, belongs evidently to *Platygonus*. The fragment here described and illustrated (pl. 4, figs. 16, 17) lacks both the base and the summit. It is 37 mm. long. Near the lower fracture the width is 12 mm.; the thickness, 7.2 mm.; that is, at this level the thickness is 0.6 of the breadth. In the canine described by Cope[2] the dimensions were 10 mm. and 6 mm.

Cope found that the lower canine of his species had the angle between the hinder face and the inner one truncated by a narrow plane which followed the length of the tooth. Such a plane appears to be represented in the tooth at hand. The hinder face is flat at the lower end of the fragment, slightly concave at the upper. It is bounded on each side by a narrow ridge. Mesiad of the inner bounding ridge is a surface flat at the upper end, slightly concave at the lower. Mesially this surface is bounded by a ridge on the inner face. The surface referred to appears to meet the requirements of Cope's description.

The inner face (pl. 4, fig. 16) of the specimen at hand is finely wrinkled in front of the ridge referred to. The outer face is more coarsely sculptured. Figure 17 of the plate cited shows a section of the tooth at the lower fracture. So far as represented, the tooth shows no wear, and it is traversed by the yet open pulp cavity.

PLATYGONUS VETUS? Leidy.

Plate 4, figs. 18–19.

This species appears to be represented by a fragment of the left ramus of the lower jaw (Cat. No. 9189) bearing the first and second true molars (pl. 4, fig. 18). The first molar is pretty well worn down, but the second only moderately so. These are referred to *Platygonus vetus* rather than to Gidley's *P. cumberlandensis*, because of the greater size of the lower teeth of the Cavetown specimen. The following measurements are taken from the specimen from Cavetown, from Leidy's measurements of the type of *P. vetus*,[3] and from the type of *P. cumberlandensis*.

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[1] Journ. Acad. Nat. Sci., Phila., vol. 11, 1899, p. 260, pl. 21, fig. 3.

[2] Idem., p. 260.

[3] Ann. Rep. Geol. Surv. Penn. for 1887, p. 14.

MEASUREMENTS OF LOWER MOLARS IN MILLIMETERS.

	Cavetown molars.	*P. vetus*, type.	*P. cumberlandensis*, type.
Length of first molar	15.5		14.4
Width of first molar	14.0		11.5
Length of second molar	20.0	20.0	17.4
Width of second molar	17.0	15.0	14.0
Length of third molar		26.5	24.0
Width of third molar		17.0	15.0

So far as shown by the first and second molars, the Cavetown specimen is quite distinct from *P. cumberlandensis*. While allowing something for individual variation, which is met with constantly in these peccaries, it appears better to refer the teeth from Cavetown to *P. vetus*. A fragment of the crown (Cat. No. 9190) of a lower tusk also is referred provisionally to this species. This fragment is only 20 mm. long. The section (pl. 4, fig. 19) forms a nearly isoceles triangle whose height is 14.5 mm. and whose base (the rear face of the tooth) is 11.5 mm. It resembles considerably the lower canine of the species named by Gidley *M. intermedius*, and possibly it belongs there. It seems to be too sharp on its front border and too thin to belong to *M. cumberlandensis*.

PLATYGONUS CUMBERLANDENSIS Gidley.

The presence of this species in the fissure at Cavetown appears to be indicated by a part of the root of a lower left canine (Cat. No. 9191). The fragment is 30 mm. long. At the lower end the pulp cavity is large; but above it is much reduced. It formed a part of a very large tooth. The fore-and-aft diameter is 17 mm.; the side-to-side diameter, 9 mm. The front border is rounded; the hinder, occupied by a conspicuous and deep groove. There is also on each lateral face a well-defined groove. A section of the tooth forms, therefore, a trefoil. The root is furnished with rather fine ridges and grooves. It appears best to refer this tooth to *P. cumberlandensis*.

Family CERVIDAE.

SANGAMONA FUGITIVA Hay.

In the collection from Cavetown there are some remains of a deer which are referred to the species described above from Whitesburg, Hamblen County, Tennessee, as *Sangamona fugitiva*. These remains consist of a lower right first incisor; a lower left first, or possibly second, true molar; the distal end of the left radius; a right scaphoid, a part of the right innominate bone surrounding the acetabulum; a left external malleolar bone, the proximal half of an astragulus; a right calcaneum; two probably metatarsal sesamoids; and first, second, and third, probably hinder phalanges. To these remains, excepting the incisor, has been given the catalogue number 9193. This tooth and the bones are entirely too large to have belonged to any known species of *Odocoileus* and too small for any known species of *Cervus.* The incisor (Cat. No. 9192) is considerably larger than the corresponding one of the Virginia deer. It is little worn. The crown is 8 mm. high and 7.5 mm. wide. The molar is worn down nearly to the base of the crown. The length is 20 mm.; the width 14.8 mm. There is a rather strong tubercle at the mouth of the principal valley. The first molar of a wapiti at hand is 24 mm. long and 15 mm. thick; in *Odocoileus virginianus*, 12.5 mm. long, 9 mm. thick. The radius is represented by only a fragment, 50 mm. long; but the articular end is unfortunately a little injured. The distal end of the ulna has been split off. The following measurements of this part in the fossil in *Odocoileus virginianus* and in *Cervus canadensis* are presented:

MEASUREMENTS OF THE DISTAL END OF RADII IN MILLIMETERS.

	Sangamona fugitiva.	*C. canadensis.*	*O. virginianus.*
Width of bone just above articular surface...	48	65	40
Thickness of bone at same level............	31	45	27

It will be observed that in size the distal end of the radius of *S. fugitiva* is somewhat nearer the Virginia deer than to the wapiti. The scaphoid bone is 26 mm. long and 32 mm. broad, these dimensions in the Virginia deer being, respectively, 19 mm. and 26 mm. The acetabulum of *S. fugitiva* has a length of 45 mm.; that of *O. virginianus* 37 mm.; that of the wapiti 57 mm. The external malleolar bone has a horizontal diameter of 26 mm. The calcaneum has lost the epiphysis. The following measurements afford means for comparisons:

MEASUREMENTS OF CALCANEA IN MILLIMETERS.

	S. fugitiva.	*C. canadensis.*	*O. virginianus.*
Total length..................................	105±	138	103
Height at articulation for fibula............	44	56	32
Thickness at lateral process.................	33	40	30

It will be seen that the bone in the fossil is a little longer than that of the Virginia deer. It is possible that more is missing than the epiphysis. The astragulus applies itself quite accurately to the calcaneum and may have belonged there originally. The width across the surface for the tibia is 30 mm. The two sesamoids are those situated at the ends of the row of four and are about one-third larger than the corresponding bones in the Virginia deer.

The first phalanx, probably a hinder one, is a larger and heavier bone than the corresponding one in the Virginia deer and smaller than in the wapiti. The following measurements are presented:

MEASUREMENTS OF HINDER FIRST AND SECOND PHALANGES IN MILLIMETERS.

	S. fugitiva.		*C. canadensis.*		*O. virginianus.*	
	First.	Second.	First.	Second.	First.	Second.
Total length	66	42	68	48	53	41
Height of proximal end	28	26	35	35	21	22
Width of proximal end	23	19	27	25	17	17
Height of distal end	18	24	21	29	14	18
Width of distal end	19	16	26	26	15	12

The ungual phalanx mentioned fits accurately to the second phalanx just described. The extreme end is broken off; but the original length was not far from 45 mm. The height, taken perpendicularly to the plantar surface, is 30 mm; the greatest thickness 18 mm.

ODOCOILEUS VIRGINIANUS (Zimmermann).

Apparently belonging to this deer are the distal ends of two radii, right and left (Cat. No. 9194). The largest piece is about 65 mm. long. Both pieces show well the articular end. The width just above the articular surface is 35 mm. While there is a possibility that these bones belong to another species there is nothing in them to prove this.

Family ELEPHANTIDAE.

ELEPHAS COLUMBI? Falconer.

From Cavetown there are present two fragments (Cat. No. 9195), taken together measuring about 300 mm., of a bone which appears to be the radius of an elephant; and, if this identification is correct, the species is very probably that named above. The bone is somewhat crushed, but its conformation agrees better with that of the elephant than that of the mastodon. There is in the collection the neural arch of a dorsal vertebra of a proboscidean (Cat. No. 9196); but it is impossible to say whether this belonged to an elephant or to a mastodon.

Family SCIURIDAE.

SCIURUS TENUIDENS, new species.

Plate 4, fig. 20.

Type specimen.—An upper left incisor, with part of the skull.

Type locality.—Cavetown, Washington County, Maryland.

Type formation.—Pleistocene.

Diagnosis.—Upper incisors broad and unusually thin; front border rounded.

The type and only known specimen of this species is a left incisor and a part of the premaxilla (Cat. No. 9197) exposed on a lump of cave earth. It is illustrated on plate 4, figure 20. The width of the tooth is 3.9 mm.; its thickness only 1.3 mm. On the same lump of clay is an upper incisor, referred to *S. carolinensis*, whose width is 3.2 mm. and whose thickness is 1.5 mm. The detached tooth referred below to *S. hudsonicus* is only 2.9 mm. wide, and is 1.5 mm. thick. Teeth of *S. carolinensis* nearly as wide as the fossil may be found, but they are thicker. *S. niger* has broad thick incisors. In both of the species just mentioned the front border of the tooth is rather flat and usually traversed by a shallow groove. In the fossil tooth the front border is rounded. An examination of a series has failed to find any squirrel with teeth so broad and thin as the fossil here described.

SCIURUS HUDSONICUS (Erxleben).

A detached upper left incisor (Cat. 9199) is referred to this species. The width is 2.9 mm.; the thickness, 1.5 mm. The incisors of this species are difficult to distinguish from those of *S. carolinensis*, but the former are on an average distinctly smaller.

SCIURUS CAROLINENSIS Gmelin.

On the lump of red clay which bears the type of *S. tenuidens* there are a part of a right premaxilla and the greater part of the corresponding incisor of *S. carolinensis* (Cat. No. 9198). The greater diameter of the incisor is 3.2 mm.; the thickness, 1.5 mm.

MARMOTA MONAX (Linnaeus).

Of this species there is a fragment of the left ramus of the lower jaw which contains the premolar and the first molar (Cat. No. 9200). It belonged to a large, heavy-jawed individual. There are present also a well-preserved lower left incisor (Cat. No. 9201), somewhat larger than any found in the collection of recent skulls, and the distal end of a left humerus (Cat. No. 9202).

Family CASTORIDAE.

CASTOR CANADENSIS Kuhl.

Of the Canadian beaver there are a fragment of a lower incisor whose width is 9 mm., and an upright third molar (Cat. No. 9203).

Family CRICETIDAE.

ONDATRA ZIBETHICA (Linnaeus).

A single lower left incisor is all that, so far as found, represents this species. The tooth belonged to a small individual.

NEOTOMA MAGISTER Baird.

In the Cavetown collection are found a part of the left premaxilla (Cat. No. 9205) inclosing a part of the corresponding incisor; also a left lower incisor (Cat. No. 9206). The latter has been identified by Dr. E. A. Goldman as belonging to *N. pennsylvanica.* The upper incisor appears to differ in no way from the corresponding tooth of Baird's types of *N. magister*, being fully as broad; but some specimens of *N. pennsylvanica* are hardly, if at all, distinguishable. On the whole, the writer prefers to refer these fossil teeth to Baird's species.

MICROTUS PENNSYLVANICUS (Ord).

Of this species there is a part of a skull in a fragment of red earth (Cat. No. 9207). It has been possible to expose an upper incisor and a part of the lower jaw showing its incisor. The remains appear to belong here.

Family ERETHIZONTIDAE.

ERETHIZON DORSATUM (Linnaeus).

Of this species there is the left ramus of the mandible (Cat. No. 9208), only the condylar and most of the coronoid processes being gone. The teeth are in fine condition. The specimen is of interest because the premolar is just making its appearance through the bone. The length of the row of molars is 19 mm. The incisor measures 5 mm. in diameter, somewhat more than in any of the skulls at hand of recent individuals. However, there appears to be no sufficient reason for thinking that it belongs to another species.

Family LEPORIDAE.

SYLVILAGUS FLORIDANUS (Allen).

This rabbit appears to be represented by a part of a left maxilla (Cat. No. 9209), in which are found the first molar, the two premolars, and the socket for the first premolar. After a close comparison with skulls of a number of species in the United States National Museum there appears to be no good reason for not identifying the jaw as that of the existing species *Sylvilagus floridanus.*

Family URSIDAE.

URSUS AMERICANUS Pallas.

In the Cavetown collection there are a nearly complete right ramus of the lower jaw, with the four chewing teeth; a fragment of a canine; a part of the right maxilla, with the bases of the crowns of the fourth premolar and the two molars; another fragment of right maxilla with sockets for the canine, for two premolars and first molar; an injured proximal end of a left femur; a complete left calcaneum and a lumbar vertebra and two metacarpals. These have the catalogue number 9210. There are in addition 18 detached teeth which represent the canines, the upper fourth premolars, and the two molars; also the lower third premolar and the first and second molars. The corresponding teeth differ considerably in size; but so they do in recent skulls. An upper right fourth premolar is larger than any corresponding tooth found in recent skulls; but probably further search would remove the difference. Its length is 13.4 mm.; its width 10 mm. The total length of the calcaneum is 74 mm. To all these loose teeth have been given the catalogue number 9211.

Family FELIDAE.

SMILODONTOPSIS MOOREHEADI, new species.

Plate 4, figs. 21–22.

Type specimen.—An upper sectorial tooth.

Type locality.—Cavetown, Washington County, Maryland.

Type formation.—Pleistocene.

Diagnosis.—Of moderate size. No protocone. Preanterior lobe very small.

In the Cavetown collection there is an upper right sectorial tooth (Cat. No. 9212) which appears to belong to an undescribed species of saber-tooth cat. It is that of the right side. It had not yet come into use and the roots had not yet developed. Views are presented showing the inner face of the tooth, and the crown from above (pl. 4, figs. 21, 22). The length of the crown is 26.5 mm.; the height of the paracone, 14 mm.; of the metacone, 9.5 mm. The width in front is 11.5 mm.; at the metacone, 8 mm. The protocone is absent. There would probably in time have been an inner anterior root. The metacone has the same length as the principal cone. Its edge is thick and is divided by a broad and very shallow transverse groove. The anterior basal lobe is larger than that of the corresponding lobe in a large specimen of the Oregon mountain lion (*Felis oregonensis*). At its base in front is what may be regarded as an extremely small, sharp preanterior lobe, which grows up from the cingulum. The latter presents one or two distinct tubercles on the outer face of the anterior lobe. From the apex of the anterior lobe there is a sharp edge which runs down on the inner face to the base of the internal root. This lobe constitutes hardly one-fourth of the whole length of the crown. The buttress descending from the summit of the principal cone to where one would look for the protocone is feebly expressed. On the inner side the edge of the crown has been splintered off. This tooth resembles that figured by Barnum Brown[1] as S. *conardi*, but it is considerably smaller than in Brown's species, and the protocone of the latter forms a distinct tubercle. The sectorial of the Cavetown species is likewise smaller than that of Cope's *Machairodus gracilis*,[1] in which this tooth has a length of 34 mm. As to Cope's *Smilodon mercerii* it is difficult to determine its size. The impression is given that it is somewhat smaller than *Machairodus gracilis*, but the measurements of some teeth indicate equality of size. What appears to be the measurements of the upper sectorial, but spoken of as pm_1 (bottom of Cope's p. 246), gives the length as only 21 mm. Cope's figure 2 of his plate 20 probably represents this upper sectorial of reduced size. In this figure the paracone towers above the rest of the tooth more than in the Cavetown tooth. On page 247 of Cope's paper cited is a description of *Felis inexpectata.* The tooth figured on his plate 21 resembles considerably the Cavetown tooth; but it was regarded as having had a protocone; also there is an angle on the internal side of the paracone descending to the protocone. This is extremely feeble in the tooth here described. The length is given by Cope as 24 mm.; the height of the paracone, 10 mm.; the width at the roots, 9.5 mm. Barnum Brown's species *Felis longicrus* may be mentioned (his paper above cited, p. 187, pl. 18). It, too, possessed a protocone. Also the base of the tooth is constricted at the paracone.

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[1] Mem. Amer. Mus. Nat. Hist., vol. 9, 1908, p. 190, pl. 19.

In the collection there is a crown (Cat. No. 9213), or rather a part of a crown, of a canine tooth (pl. 4, fig. 23), taken to be a left upper, which the writer has not been able to identify satisfactorily, either generically or specifically. It is quite different from the canines of the mountain lion. It is relatively thin, has sharp edges in front and behind, and the two sides are equally convex. The tooth had probably not been cut, as the great pulp cavity remained and is now full of red clay. On what is probably the outer face some of the material of the tooth is gone. On the other face there appear eight or nine longitudinal ridges, with intervening grooves. They continue to about 10 mm. from the tip of the tooth, and are more distinct toward the base. There are seen traces of similar ridges and grooves on the injured face of the tooth. The tooth as preserved is 25 mm. high. The long diameter at the base was close to 10 mm.; the transverse diameter, close to 6 mm. The writer suggests that this was a milk canine of a saber-tooth cat, possibly of the species here described; possibly of the same individual. Besides these teeth, there is present from Cavetown the proximal end of a femur (Cat. No. 9214) of some large cat-like animal. It resembles closely the same part of a tiger from the Malay Peninsula (No. 49728, U.S.N.M.), and it is but little smaller. In the tiger the distance from the inner surface of the head of the femur to the outside of the great trochanter is 78 mm.; in the fossil this measurement is 76 mm. The lesser trochanter is not so strongly developed as in the tiger femur at hand.

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[1] Journ. Acad. Nat. Sci. Phila., vol. 11, 1899, pp. 240–244, pl. 20.

FELIS COUGUAR? Kerr.

In the collection there is a fragment (Cat. No. 9215) of the left ramus of a lower jaw of a felid which may have been that of the species here described. It contains the roots of the sectorial, but the crown is gone. The height of the jaw is 21 mm. at the sectorial; its thickness is 9 mm. These are almost exactly the height and thickness of the jaw of a mountain lion (No. 21078, U.S.N.M.).

4. COLLECTION FROM ALTON, ILLINOIS.

In the United States National Museum there is a very considerable collection of Pleistocene mammals that was made many years ago by Hon. William McAdams, of Alton, Illinois. He reported briefly on this collection at the Minneapolis meeting of the American Association for the Advancement of Science, in 1883.[1] He stated that the "bluff clays," now called loess, were nearly 100 feet thick at Alton, and were remarkably rich in animal remains, such as teeth and bones, attached to calcareous nodules or clay stones. Remains of 13 different species had been found, all probably extinct.

It appears that McAdams's collection was secured for the United States Geological Survey by Prof. O. C. Marsh. It remained at Yale University many years without being studied. On Professor Marsh's death the collection was brought to the National Museum, and the writer has the privilege of examining it. As stated by McAdams, the specimens of bones and teeth are attached to, or rather are partly or wholly inclosed in, hard nodules. These nodules are composed of very fine grains of sand cemented together by calcium carbonate. The material is very compact, and there is extreme difficulty in removing from it the fossils without injuring the latter. In the collection the writer has found the following species. The extinct forms are indicated by the dagger.

†*Megalonyx jeffersonii.*
†*Equus*, sp. indet.
†*Platygonus compressus?*
†*Sangamona fugitiva.*
†*Cervalces roosevelti?*
†*Rangifer muscatinensis?*
†*Taurotragus americanus.*
†*Symbols promptus?*, new species.
†*Bison*, sp. indet.
†*Mammut americanum.*
Marmota monax.
Castor canadensis.
†*Castoroides ohioensis.*
Geomys bursarius.
Ursus americanus.

Of the 15 species here identified there are 11 which are now extinct—75 per cent. This high percentage of extinct forms is probably due to the accidental exclusion of a number of still existing species that might be expected to occur there.

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[1] Proc. Amer. Assoc. Adv. Sci., vol. 22, p. 268.

It would be interesting to know exactly the geological age of the deposits in which these species were found. The writer is informed by Dr. E. W. Shaw, of the United States Geological Survey, who is familiar with the Pleistocene deposits about Alton, that there are at that place deposits of loess of three or four Pleistocene stages; but these have not yet been well differentiated, nor is it known exactly where McAdams secured his specimens. Although he said that the loess there was rich in teeth and bones, he also added that a majority of his specimens were found in one quarry. This would appear to mean that they had come from the loess overlying some stone quarry or possibly from that filling a crevice of the limestone. Doctor Shaw assures the writer that the nodules are those of the loess.[1]

McAdams very probably had a catalogue of his collection, for on many of the specimens there is pasted a printed number. This catalogue, if there was one, has apparently been lost.

MEGALONYX JEFFERSONII (Desmarest).

The genus *Megalonyx* is represented in the collection from Alton by a fragment, about 1 inch long, of a molar tooth (Cat. No. 8999). After a comparison with Leidy's figures[2] it is evident that the tooth was a lower right molar, probably the hindermost one. It does not agree wholly with Leidy's three figures of this tooth,[3] nor do these figures resemble one another too closely. It is taken that the figure last mentioned, made especially by Leidy, in order to be accurate, is most to be relied on. From this figure it appears that the front and rear faces were convex, while in the Alton specimen they are slightly concave. The inner face of the latter tooth is more rounded than shown in Leidy's figures. The tooth, too, is thinner from front to rear (16 mm.) than in the one described by Leidy (8.5 lines=17.7 mm.). The pulp cavity is shown at one end of the fragment and is filled apparently by fine sand and loess.

EQUUS, sp. indet.

In the Alton collection, with the number 25, is a portion of an incisor of a horse (Cat. No. 9000). It has no loess attached to it, but some brown iron oxide. It is pretty certainly a fossil, but was probably not found in the loess.

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[1] Since this paper was put into type Mr. Morris M. Leighton, of the State Geological Survey of Illinois has informed the writer of investigations made by him recently under the direction of the head of the survey, Dr. F. W. DeWolf. Mr. Leighton had the good fortune to find Mr. John D. McAdams, a son of the collector of the fossils, who pointed out to him the quarry in which his father had collected most of the specimens. These occurred at the base of the loess, but apparently in the upper part of the drift. While the exact age of the deposit is somewhat in doubt, Mr. Leighton regards it as belonging probably to the Sangamon.

[2] Smiths. Contr. Knowl., vol. 7, 1855, art. 5.

[3] Idem, pl. 5; pl. 6, fig. 11; and pl. 16, fig. 17.

PLATYGONUS COMPRESSUS? Leidy.

There is in the collection a fragment of a lower right canine tooth of a peccary (Cat. No. 9001), which is identified provisionally as that named. The fragment is 35 mm. long, 14 mm. from the acute front edge to the slightly concave hinder face, and 11 mm. across this hinder face, the measurements being taken at what was about the middle of the height of the crown. On the outer face there is a median ridge bounded in front and behind by shallow grooves.

SANGAMONA FUGITIVA Hay.

Plate 5, figs. 5–6.

In the collection made at Alton are two nodules of loess with each a part of the right ramus of the lower jaw and three molars of a large deer. In the better specimen (Cat. No. 9002. Pl. 5, figs. 5, 6) the first molar is much damaged and the third has lost most of the hinder lobe. The inner faces of the teeth are mostly hidden in the hard nodule. The first molar was close to 15 mm. in length. The second is 18 mm. long and about 13 mm. wide. The third molar, not including the third lobe, is 18 mm. long; including the third lobe, it was about 22 mm. long; the width, about 13 mm. The crowns are only moderately worn. The other nodule (Cat. No. 9003) presents the same sides of the teeth, the inner faces being more concealed than in the first nodule. The crowns are less worn and have a height of about 15 mm. The teeth are apparently larger than in the other specimen, the first and second lobes of the third molar, taken together, measuring 20 mm.; with the hinder lobe, about 27 mm. At the outer mouth of the median valley of these teeth there is a conspicuous accessory pillar. The crowns of the lower molars are higher than in *Odocoileus.* The inner faces of the lobes are flatter than in *Odocoileus*, and the styles are less conspicuous.

These teeth are entirely too large to have belonged to any of the existing species of *Odocoileus;* and they are, relatively to the length, much broader. They agree in size so well with the upper tooth which forms the type of *S. fugitiva*, found at Whitesburg, Tennessee, and with the lower tooth found at Cavetown, Maryland, that they are referred to that species. In size they agree well with the lower molar found at Cavetown, Maryland, and referred to *S. fugitiva.*

CERVALCES ROOSEVELTI? Hay.

Plate 6, figs. 1–2; 5–8.

To this species are referred, with some reservations, an upper left second premolar, three upper molars, and a fragment of the right ramus of the lower jaw with four teeth. The upper teeth (Cat. No. 9004) consist of a right third molar and left second and third molars. These are practically free from any loess, while the lower teeth (Cat. No. 9005) are pretty well buried in it. The left upper second and third molars are here figured (pl. 6, figs. 7, 8) and the lower left second and third molars (same plate, figs. 3, 4). The latter came from Afton, Oklahoma, and are described below.

The upper teeth evidently belonged to a young but mature animal, and they are very little worn. The premolar resembles rather closely that of *Alces americanus*. Its length is 24 mm.; its width, 25 mm.

MEASUREMENTS OF UPPER MOLARS IN MILLIMETERS.

	Second molar.	Third molar.
Height	25	27
Length on midline	29	32
Length on outer face near summit	31	34
Width at base of front lobe	31	33
Width at base of hinder lobe	27	30.5

The writer has described [1] the teeth of the type of *Cervalces scotti*. It will be seen that the teeth of the Alton collection are somewhat larger; especially they are relatively broader, but this may not be decisive. The teeth in hand differ from those of the existing moose as there indicated. The mesostyle of *Cervalces* is more prominent and has an excavation in front of it, especially deep in m^1. Also the style on the face of the anterior lobe is much more strongly developed, increasing in thickness to the cingulum; whereas in *Alces* it subsides before reaching the base of the crown. The lower jaw has a depth of 58 mm. at the second molar. The length of the fourth premolar and the three molars taken together is 122 mm.; that of the three molars, 95 mm. These dimensions are somewhat greater than in the type of *C. scotti*. These teeth are considerably worn and are badly hidden by the hard mass of loess, so that the individual dimensions, especially the thickness, can not be accurately determined. The outer faces are mostly hidden. The fourth premolar is 27 mm. long and apparently 17 mm. thick. The first molar is 25 mm. long; the second close to 30 mm.; the third between 37 and 40 mm. All these lower teeth resemble closely those of *Alces americanus*, but the style on the inner face of the front lobe appears to be somewhat more sharply defined than in *Alces*, and at the base of the tooth comes out even with the plane of its inner face.

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[1] Thirty-sixth Ann. Report Geol. Surv. Ind., p. 626.

RANGIFER MUSCATINENSIS? Leidy.

In the collection, with McAdams' number 11, is a tooth of a *Rangifer*, apparently an upper right fourth milk molar (Cat. No. 9006). This is referred provisionally to the species named above. The length of the crown near the outer face is 17 mm.; the width is 13 mm.

TAUROTRAGUS AMERICANUS Gidley.

Plate 5, figs. 7–11.

In the collection made by Mr. McAdams there are found 11 molar teeth, upper and lower, which are to be referred to the species described by Gidley, from a cave at Corriganville, Maryland. Of these 11 teeth, 3 belong to the upper jaw; the remainder to the lower. The upper teeth consist of second molars, right and left, and a left third molar, probably all of the same individual. Of the lower teeth there are first molars, right and left; a right second molar; a left third molar, practically complete, and part of that of the right; all of which, except probably the last, may have belonged to the same individual to which the upper teeth belonged. All these have the catalogue number 9007. Then, there is another last molar which is much more worn than those above recorded (Cat. No. 9008). One of the other somewhat damaged teeth is determined as a lower right first molar (Cat. No. 9008). The height of these teeth is given in the following table of measurements. It varies, of course, in the same tooth with the degree of wear, and perhaps with the degree of development of the base. The width is taken on the flat face of the tooth and about 25 mm. above the base. The thickness is the greatest, taken at the base.

MEASUREMENTS OF MOLAR TEETH IN MILLIMETERS.

Teeth.	*T. americanus*, Alton.		*T. americanus* type.
	Upper.	Lower.	Upper.
Molar 1:			
Height	....	40	28
Length	....	29	29
Width	....	20	26
Molar 2:			
Height	44	48	40
Length	33	33	34
Width	30	24	29
Molar 3:			
Height	50	42	50
Length	37	50±	35
Width	33	22	32

No differences that are certainly of specific importance are observed on comparison of the upper second and third molars of the

Alton specimens with those of the type. The mesostyles and parastyles of the latter appear, however, to be slightly more strongly developed, while the ribs, or styles, on the faces of the lobes are narrower and more sharply defined on the Alton teeth. In the valley between the two lobes of the last molar, on the inner face, there is seen an accessory pillar, small on one tooth, well developed on the other. A very small pillar occurs rarely in the same position in the molars of *T. oryx.*

Figure 8 of plate 5 presents a view of the inner face of the lower left first molar. It is considerably larger than the corresponding tooth of the African eland. It appears to be slightly worn, but the apex is hidden in the hard nodule. At the rear of the anterior lobe, in the upper half of the crown, a style develops which becomes quite prominent. At the hinder border of the tooth is another sharp style. The writer has found no specimen of the African eland with unworn teeth with which to compare the upper halves of the crowns. The lower right second molar (pl. 5, fig. 9) is shown here. On the inner face, at the rear of the anterior lobe, is a style similar to that of the first molar. Evidently there is nothing of the kind in the African eland. Figure 10 of plate 5 represents the inner face of the lower left hindermost molar. It had not yet come into use and the base had hardly been completed. It differs from the corresponding tooth of *T. oryx* in having a style on the rear of the anterior lobe. On the plate cited (fig. 11) is shown the upper right second molar. The measurements of it are given in the table.

In the United States National Museum there is a lower left hindermost molar (Cat. No. 4987) of this species which was collected several years ago at Kimmswick, Missouri, about 20 miles south of St. Louis and 40 miles south of Alton. The height of this tooth is 50 mm.; the length 53 mm.; the thickness at the base of the first lobe, 23 mm.; that at the base of the second lobe, 24 mm.; that at the base of the third lobe, 15 mm. At their summits the thickness of the lobes in their order is 19 mm., 18 mm., and 11 mm. It is difficult to distinguish these lower hindermost molars from the corresponding ones of camels.

In 1913[1] Dr. Paul Matchie noted Gidley's description of the American eland. He was unable to find a series of teeth in the African eland which corresponded to Gidley's figure of the fossil eland or was in any way similar to it ("oder ihr wenigstens ähnlich ist"). It is difficult to understand in what sense this statement is to be taken. The teeth of both animals are not greatly different in size and proportions. They are strongly hypsodont and are similarly lobed. In both series of molars the parastyles, the mesostyles, and the metastyles are prominent; the faces of the lobes between these styles are traversed each by a corresponding and very similar rib. In many details they are closely alike. In case Matchie meant that the two sets of teeth are not absolutely alike, that is another matter. The premolars of the two animals do differ, and possibly a distinct genus might be erected on the differences; but that need not exclude the idea that they would be closely related.

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[1] Sitz.-Ber. Ges. Naturf. Freunde, Berlin, 1913, p. 258.

The fourth premolar of the existing eland has its anterior and rear styles thinner and more prominently outstanding than has the fossil. The fossil tooth has its inner face more flattened than that of the existing eland. The same remark is true with regard to the third molar. Also, in the existing eland there is a deep channel just behind the anterior style, which is only slightly indicated in the fossil. In the fossil eland the lower molars possess a distinct style on the inner face at the hinder border of the anterior lobe, or metaconid.

A tooth (Cat. No. 9009) which appears to be the lower right fourth milk molar is represented on plate 5, figure 7. Most of the inner face of the hinder lobe is broken away. The tooth had not yet come into use. Its height is 22 mm., its greatest length 37 mm., its thickness 15 mm. There is, besides, a damaged tooth (Cat. No. 9009), which may be an upper milk molar. Its height is 25 mm., its length about 28 mm., its width at the hinder end 16 mm. On the hinder border is a prominent cingulum, which has in front of it a deep pit, somewhat as in the same tooth in *Odocoileus*.

SYMBOS PROMPTUS? new species.

To this species are referred a single tooth, taken to be a lower left second molar, whose base is buried in a loess nodule (Cat. No. 9011). The molar is worn down until it is only about 15 mm. high. The crown is 34 mm. long, and 25 mm. wide near the base. The tooth must be referred only provisionally to this species, the type of which is described below, from Afton, Oklahoma. The inner face of the tooth from Afton lacks the styles and ribs which characterize the corresponding tooth of *Taurotragus*.

BISON, sp. indet.

In the McAdams collection there are found three upper molars (Cat. No. 9012); namely, second molars, right and left, and a hindermost right molar. These are in separate nodules, but they are little or not at all worn, and may all have belonged to the same individual. The following measurements are furnished:

MEASUREMENTS OF SECOND AND THIRD UPPER MOLARS OF BISON IN MILLIMETERS.

	Height.	Length at base.	Length at summit.	Width at base.
Second molar	70	35	39	31
Third molar	56	35	41	29

There is also an upper third right molar of another individual (Cat. No. 9014).

These teeth are larger than any known to the writer which belong to *Bison bison*, even larger than those of a large male from Alberta.[1] There is present also a lower hindermost left molar (Cat. No. 9013), considerably worn, and also damaged in front. Its length at the base was 50 mm. It is impossible to say to what species of *Bison* these teeth belonged; but quite certainly not to *B. bison*. They are larger also than the teeth of *B. occidentalis*.[2] Possibly they are the teeth of *B. latifrons* or those of *B. regius*.

MAMMUT AMERICANUM (Kerr).

This species is meagerly represented in McAdams' collection. There are only a fragment of what appears to have been a root of a molar (Cat. No. 9015) and a fragment of a cusp (Cat. No. 9016) of a very immature molar.

MARMOTA MONAX (Linnaeus).

Of this species there are in the collection four incisor teeth. Two are upper incisors, side by side in a nodule. Another upper incisor is partly inclosed in a nodule, and a lower incisor is similarly placed. There appears to be no reason for regarding these teeth as belonging to any other species.

CASTOR CANADENSIS Kuhl.

This species is represented by 13 nodules, which contain the lower teeth or some of them, with sometimes a part of the bone badly preserved; and by several loose lower teeth and a single upper molar. These specimens have the United States Museum numbers 9020–9034. One nodule (U.S.N.M. Cat. No. 9026), marked by McAdams' number 205, presents four molars and a part of one lower incisor. This still retains its orange color. The length of the tooth row on the grinding surfaces is 30 mm. The incisor is 7 mm. wide. Another nodule (Cat. No. 9027), mostly dissolved away or never formed, presents the molars and most of that part of the incisor which was yet in the bone. The incisor is still yellow. The length of the tooth row is 31.5 mm. The part of the incisor present is 58 mm. long and 8 mm. wide. In one nodule (Cat. No. 9021) the incisor has a width of 9 mm.; the anterior grinding tooth, a width of 8 mm. These must have belonged to an unusually large individual.

CASTOROIDES OHIOENSIS Foster.

In the collection there is a lower left incisor with some of the base missing and a little of the tip. The length of the fragment is 240 mm. The vertical diameter is 29 mm.; the transverse, 23 mm. There are, besides, a fragment of another incisor and a single enamel plate of a molar.

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[1] Thirty-sixth Ann. Rep. Geol. Surv. Ind., p. 648.

[2] Twenty-third Ann. Rep. Geol. Surv. Iowa, p. 320.

GEOMYS BURSARIUS (Shaw).

In the collection there are over 50 nodules which contain remains of this species of *Geomys;* besides which there are various detached incisors. In most cases little more than teeth are to be seen. In a few of the nodules, however, there are exposed considerable parts of the skull, so that most of the characters can be determined. Most of the specimens have incisors which are broader than those of the average individuals represented in the United States National Museum; but in the collection mentioned there are a few which have equally large teeth. In two of the skulls from about Alton the upper incisors show a faint groove near the outer border. This has been observed by the writer in several recent skulls.

URSUS AMERICANUS Pallas.

A right ramus of the lower jaw, with well-preserved third and fourth premolars and the two molars, together with the canine lacking the tip, is not distinguishable from these parts of the existing bear, *U. americanus.* The United States National Museum catalogue number is 9097.

5. COLLECTION FROM NEAR AFTON, OKLAHOMA.

In 1903[1] Prof. W. H. Holmes reported on The flint implements and fossil remains from a Sulphur Spring at Afton, Indian Territory. The importance of this spring, which is situated between Afton and Miami, was first noted by Dr. R. H. Harper, of Afton, who, about the year 1900, discovered in it remains of mastodons and elephants in close association with flint implements. Excavations were undertaken there by Professor Holmes, and his efforts were rewarded by the finding of some hundreds of weapons and implements of flint and bone, and the teeth and bones of many mammalian animals. These bones and teeth are now preserved, partly in the department of paleontology, partly in that of anthropology, in the United States National Museum. In the report referred to the animals mentioned are two species of elephants, buffalo, deer, elk, and horses, domestic and extinct.

By far the greater part of the bones and teeth, as well as the artifacts, were found within a few feet of the funnel of the spring and between depths of 2 and 7 feet. At the surface was muck to a depth of 2 or 3 feet, but thinning out away from the spring. Below was a bed of fine sand, not local but extending out on all sides as if deposited by water. Downward, this bed becomes more gravelly

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[1] Rep. U. S. Nat. Mus. for 1901, pp. 237–252, pls. 1–26.

In this muck nothing was found except fragments of buffalo bones. The remains of extinct animals were all found in the sandy and gravelly layers. In Professor Holmes's report (pl. v) is shown a section of the excavation and the distribution of the teeth and bones. On account of the incoming water the work of excavating was troublesome. As a result of this perhaps the depths at which the various specimens were secured was not recorded, except in a few cases.

The writer has had the opportunity of studying this collection and has identified the following species:

†*Equus complicatus.*
†*E. laurentius.*
†*E. excelsus.*
†*E. hatcheri.*
†*E. holmesi*, new species.
†*Camelops kansanus?*
†*C. nitidus*, new species.
Odocoileus virginianus.
Cervus canadensis.
†*Cervalces roosevelti?*
Alces americanus.
†*Symbos promptus*, new species.
†*Bison*, sp. indet.
Bison bison.
†*Mammut americanum.*
†*Elephas columbi.*
†*E. imperator.*
†*Castoroides ohioensis.*
Canis nubilus.
C. latrans.

The writer does not believe in Professor Holmes's theory (his report, p. 243) that these bones and teeth had been gathered up in the surrounding country by Indians and thrown into the spring as offerings to the spirits. His section just referred to confutes this view. The species mentioned and most of the others must originally have been left in the deposit not far from the spring. The horses and camels and the imperial elephant belong to the fauna of the first interglacial stage, the Aftonian. Some of the other species are known to have existed at the same time and all of them may have existed then. Some of these species certainly may have been buried there at a later time. Certainly too, that bed of muck, 2 feet or more in thickness, had not accumulated there within a short time, and it was almost barren of fossils. It will be observed that 14 out of the 20 species represented are now extinct. The writer has elsewhere discussed the discovery at Afton.[1]

Family EQUIDAE.

EQUUS COMPLICATUS Leidy.

Plate 7, fig. 1.

Of this species there are identified three large second upper premolars (Cat. No. 9098), an upper left milk molar (Cat. No. 9099), and

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[1] Amer. Anthropologist, vol. 20, 1918, pp. 21–23.

13 lower teeth, premolars and molars (Cat. No. 9100). Three teeth (Cat. No. 9101) are the premolars of the right side of the lower jaw and are here illustrated (pl. 7, fig. 1).

EQUUS LAURENTIUS Hay.

To this species are referred six upper premolars and molars (Cat. No. 9102). They are all well-preserved teeth, mostly not much worn. Similarly preserved lower teeth, 12 in number (Cat. No. 9103), are referred provisionally to the species; but they, or some of them, may belong with the upper molar here identified as *E. excelsus.*

EQUUS EXCELSUS Leidy.

An upper tooth (Cat. No. 9106), probably a fourth premolar, is identified provisionally as that of *Equus excelsus.* The enamel surrounding the fossettes is little plicated. The crown is 70 mm. high, 27 mm. long, and 26 mm. wide, and it is considerably curved. An upper tooth (Cat. No. 9105), apparently the first molar, is 60 mm. high, 24.5 mm. long, and 26.6 mm. wide. Another tooth, now in the department of anthropology, is referred to the same species. It is considerably curved, so that the outer and the front faces are convex. It is not unlikely that some lower teeth belong here.

EQUUS HATCHERI Hay.

Plate 7, fig. 2.

A single tooth (Cat. No. 9107) is recognized as belonging to this species. A view of a cross section is given (pl. 7, fig. 2). This is taken at the middle of the height of the crown. The length is 28 mm.; the width, 28 mm. It will be observed that the enamel is considerably plicated. The tooth appears to be a first or a second upper molar.

EQUUS HOLMESI, new species.

Plate 7, figs. 9–12.

Type specimen.—Four upper teeth of the right side—namely, premolars 3 and 4, molars 1 and 2. Cat. No. 8642, U. S. National Museum.

Type locality.—Northeastern Oklahoma.

Type formation.—Pleistocene.

Diagnosis.—Teeth large. Enamel of fossettes, with only medium complication; styles unusually broad.

In the department of paleontology are four upper teeth which have the catalogue number 8642. Four similar teeth have been retained in the department of anthropology. These all appear to have belonged to the same individual. Those in the department of paleontology consist of the third and fourth premolars and the first and second molars, all of the right side. Two of those in the department of paleontology pm^4 and m^2 are figured (pl. 7, figs. 9–12). They have suffered only a moderate degree of wear. The measurements obtained from these teeth are as follows:

MEASUREMENTS OF UPPER PREMOLARS AND MOLARS.

	Height.	Length.	Width.	Width of protocone.
Third premolar	62	33	32	15
Fourth premolar	63	31. 5	32	15. 5
First molar	55	30	30. 5	15. 5
Second molar	68	29	29. 5	16. 5

The parastyles and mesostyles of these teeth are unusually broad. The width of the parastyle of the third premolar is nearly 8 mm.; that of the mesostyle, 8.5 mm. The widths of the styles of the fourth premolar are only slightly less. The parastyles are traversed by a well-defined narrow channel. The styles of the molars are about 5 mm. wide at the grinding surface, but they broaden somewhat toward the base. The second molar has the styles obscurely channeled. These styles are broader and more distinctly grooved lengthwise than are those of a very large domestic horse at hand.

The measurements show that the protocones do not vary much in width in the different teeth; also they diminish little or not at all in width toward the base of the tooth. The post-protoconal valley is directed so that its axis continued would meet the front of the tooth at the middle of the width. The direction is the same in premolars and molars. In *E. caballus* the axis of the valley of the molars is inclined toward the inner face of the tooth. At the head of the valley of the premolars of *E. holmesi* there is an inflection of the enamel; in the molars this is minute or wanting. The enamel of the fossettes is relatively simple, more so than in *Equus caballus.* In the premolars there is a pretty deep notch or loop in both the front and the rear walls of both fossettes. In the front wall of the postfossette, outside of the large loop, there are one or two small inflections of the enamel. Facing the head of the post-protoconal valley is a deep somewhat M-like inlet into the fossette. In the molars the notch in the front of the prefossette is small or wanting. The cornua of the fossettes are broad. According to Professor Holmes's account already referred to (his page 241) these teeth were regarded as those of the domestic horse. They were found, however, at a depth of 7 feet or more and closely associated with teeth of apparently *Elephas imperator.* These teeth are too large to have belonged to the domestic horse; the enamel is of too simple a pattern, the styles are too broad, and there are other differences. The size of the teeth is not different from the teeth of *E. scotti* (probably the same species as *E. complicatus*); but there are many characters in the way of regarding the Afton teeth as belonging to this species. The teeth of specimens of *E. scotti* in the American Museum of Natural History, from which the writer has a squeeze of the left cheek teeth of No. 10628, have the enamel strongly plicated; the post-protoconal valleys of the premolars have deep inlets at the head, and they are directed nearly toward the outer anterior corner of the tooth. The axis of the protocones is also oblique. In the molars the valley mentioned is turned more toward the inner side of the tooth and the protocones are nearly parallel with the axis of the tooth row.

In general the teeth from Afton are not greatly different in size from those of *E. occidentalis*;[1] but, according to Merriam's measurements, the width of each tooth is less than the length of the grinding surface; while in *E. holmesi* the width at least equals the length. The plication of the enamel of the fossettes in *E. occidentalis* is still simpler than in *E. holmesi*. In many respects the teeth from Afton resemble those teeth from Silver (or rather Christmas) Lake, Oregon, which were described and figured by Gidley.[2] In those teeth, however, the enamel of the fossettes is far more complicated than in the teeth from Afton. For the present, therefore, it is thought best to apply a new name to the latter. This is given in honor of Prof. W. H. Holmes, in recognition of his contributions to geology and anthropology.

Family CAMELIDAE.

CAMELOPS KANSANUS? Leidy.

To this species are provisionally referred five teeth. All appear to be thoroughly fossilized and are stained blue or black. An upper left first molar belongs in the department of anthropology. It is only slightly worn. The type of *C. kansanus* had no teeth and the teeth that have been referred to this species may belong to other species. The Afton teeth are here compared with teeth of *C. huerfanensis* (Cragin). They belong possibly to this species. Measurements in millimeters of this tooth and the corresponding one of the type of *C. huerfanensis* are presented.

MEASUREMENTS OF UPPER FIRST MOLARS.

	Type tooth.	Afton tooth.
Length of crown at base	33	28
Length of crown 35 mm. above base	38.5	43
Width of posterior lobe at base	30	25

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[1] Merriam, J. C., Bull. Dept. Geol. Univ. Calif., vol. 7, p. 410.

[2] Bull. Amer. Mus. Nat. Hist., vol. 14, 1901, p. 116, fig. 11.

It will be observed that the Afton tooth is both shorter and narrower at the base, but that it expands more rapidly upward. At the summit its length is 53 mm. Its whole height is 60 mm.

Another tooth is a lower left hindermost molar, now in the department of anthropology. Its dimensions in millimeters are here compared with those of the corresponding molar of the type specimen of *C. huerfanensis* and those of a specimen from Minidoka, Idaho.

MEASUREMENT OF LOWER HINDERMOST MOLARS.

	Type.	Minidoka tooth.	Afton tooth.
Height of crown	65	63	50
Length of crown at middle of height	62	56	51
Width at base of second lobe	21	20	21

The Afton tooth is seen to be somewhat smaller than the others. It differs from the others in having on the inner face a pronounced groove opposite each of those on the outer face, and in having in front of each groove a pretty strongly developed style. There is a part of another lower third molar, the second and third lobes, in the department of paleontology. Two upper fourth premolars are preserved, one in each of the departments mentioned. The one in the department of anthropology is little worn; the other (Cat. No. 9109) is well worn. The following measurements allow these to be compared with the corresponding tooth of *C. huerfanensis:*

MEASUREMENTS OF UPPER FOURTH PREMOLARS.

	Afton tooth.	Afton tooth.	*C. huerfanensis.*
Height of crown as preserved	45	24	35
Length of crown at base	16	18	22
Length at height of 25 mm	19	21.5	26
Width of crown at base	24	25	25

While one must expect differences in the size of teeth of these camels, they are so great between the form found at Afton and the corresponding teeth of the type of *C. huerfanensis* that it appears to be better to refer those from Afton to *C. kansanus*, with some doubt.

CAMELOPS NITIDUS, new species.

Plate 7, figs. 3–8.

Type specimen.—A lower first molar, No. 9111, United States National Museum.

Type locality.—Region about Afton, Oklahoma.

Type formation.—Pleistocene.

Diagnosis.—An animal of medium size. First lower molar as in *Auchenia*, except that the anterior outer style is missing.

In the collection from Afton there are found three teeth which are regarded as having belonged to a species of camel. It has further been found impossible to refer these teeth to any of the hitherto described species; hence a new name is proposed.

The teeth belong to the left side and are identified as the fourth premolar and the first and second molars. They belonged certainly to as many individuals. The premolar (Cat. No. 9110) is much worn (pl. 7, figs. 7, 8). It retains both roots. The length is 18 mm.; the width, 9.1 mm. On the inner face is shown a deep sulcus, in front of which the tooth is bent somewhat inward. It was at first concluded that this premolar might be referred to *Camelops macrocephalus* (Cope); but the length is too great, and in that species the anterior part is straight, not incurved.[1] The hinder end is deeply notched by wear against the first molar. The tooth taken to be the first molar (Cat. No. 9111) is only moderately worn and is in good condition of preservation (pl. 7, figs. 3, 4). The roots are broken off and there is a considerable pulp cavity, now filled with clay. The height of the crown is 26 mm.; the length at about half the height of the crown, 26 mm.; the width at the base, 23 mm. On the inner face there is a rather deep groove between the two lobes and opposite the outer groove. The inner and outer grooves are only slightly separated. In front of the inner groove there is a well-developed rib, as there is in the llama. According to Cope, as cited, this rib is not present in the first molar of *Camelops macrocephalus*, but is present in the second molar. On the inner face there is a narrow style along the front of the tooth and a broader one along the rear of the hinder lobe. The tooth resembles closely that of the llama, but does not have the prominent fold found on the anterior border of the outer face of the tooth. The tooth identified as the second molar (Cat. 9112) is only slightly worn (pl. 7, figs. 5, 6). The height of the crown is 45 mm.; the length, taken at the base, is 24 mm.; at half the height, 25 mm. The tooth differs in some ways from the first molar and possibly belongs to another species. There is hardly that difference in size that might be expected. The anterior inner style is more prominent than in the first molar, while the rib in front of the internal groove is hardly perceptible in the lower half of the crown. As will be observed from the figure of the inner face, the hinder lobe is shorter fore and aft than the anterior lobe; but it is possible that this is abnormal and due to pressure on the pulp before calcification.

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[1] Cope, Rep. Vert. Paleont., Llano Estacado, 1893, p. 86, pl. 23, fig. 5.

Family CERVIDAE.

ODOCOILEUS VIRGINIANUS (Zimmerman).

In the paleontological collection are a part of an antler, six cubonavicular bones, an upper right very slightly worn molar, apparently the hindermost, and a lower left second molar. These have the museum's catalogue number 9113. They probably belong to the species named above, but the upper molar by its size and development of the styles seems to approach *O. hemionus*. This molar is 15.5 mm. long on the outer face and at the base; 18 mm. at the summit. The width is 16 mm.; the height of the crown, 14.5 mm. Several metapodials and fragments of antlers are preserved in the department of anthropology of the United States National Museum.

CERVUS CANADENSIS (Erxleben).

This species is represented by one tooth, a lower right fourth premolar (Cat. No. 9114), and a fragment of an antler.

CERVALCES ROOSEVELTI? Hay.

Plate 6. figs. 1–2, 5–8.

In the Afton collection there are three upper premolars, a part of an upper molar, a lower incisor, and a part of the left ramus of the lower jaw, with the second and third molars. To the incisor has been given the catalogue number 9115; to the premolars and fragment of molar, the number 9116; to the lower molars, the number 9117. More especially on geographical grounds these teeth are referred to *C. roosevelti.* The writer has not had the opportunity to compare them with those of the fine specimen of *C. scotti*, at Princeton, New Jersey. The upper premolars differ from those of *Alces americanus* in the much wider anterior style, this having a width of about 8 mm. at a level 10 mm. above the base of the tooth. What is taken to be an upper third premolar measures 23 mm. in length at the base, 29 mm. in width. A fourth premolar is 25 mm. long at the base and 30 mm. wide. The incisor, a first or second, differs from that of the existing moose in having a much longer lingual surface (pl. 6, figs. 5, 6). The width is 14 mm. The lower molars (pl. 6, figs. 1, 2) resemble closely those of *Alces*. On comparison with a number of teeth of the latter it appears that on the inner face of the hindermost molar the ribs on the first and second lobes of *Cervalces* are more strongly developed, so that the face is hardly concave, and may be even convex. The median rib increases in width as it approaches the cingulum and coalesces with the style behind it, which is also broader than in *Alces*. In the case of the second molar these differences do not seem always to hold good. The length of the second molar is 27 mm.; its width, 21.5 mm. The length of the third molar is 41.5 mm.; its anterior width, 21.5 mm.

ALCES AMERICANUS Jardine.

Plate 6, figs. 3–4.

Of the existing moose there is found in the collection a single incisor (Cat. No. 9118). It presents no differences when compared with the same tooth of a recent specimen. It is shown here in comparison with the incisor of *Cervalces roosevelti* (pl. 6, figs. 3, 4).

Family BOVIDAE.

SYMBOS PROMPTUS, new species.

Plate 6, figs. 9–10; plate 8, figs. 1–6.

Type specimen.—An upper left third molar (Cat. No. 9120, U.S.N.M.)

Type locality.—Northeastern Oklahoma.

Type formation.—Pleistocene.

Diagnosis.—Upper molars with the external styles less strongly developed than in *S. cavifrons;* the fossettes less angular.

In the collection made near Afton are various remains of a musk ox which appear to be referable to the genus *Symbos*, but which do not belong to any of the species described. There are present a molar taken to be the upper hindermost (Cat. No. 9120), a part of an atlas, a cervical vertebra, two dorsals, and one lumbar. All of the vertebrae are more or less damaged by loss of parts.

The upper molar (pl. 6, figs. 9, 10) is worn down to about one-half of the original height of the crown. The present height is about 25 mm. The length is 39 mm. at the grinding surface, on the outer face of the tooth; 38 mm. near the base; and 36 mm. along the middle of the width. The width at the base of the front lobe is 36 mm. On comparing this tooth with a photograph of the teeth of a fine skull of *Symbos cavifrons* found near Ann Arbor, Michigan, and described by Dr. E. C. Case,[1] it appeared that the parastyle and the mesostyle were less strongly developed than in *S. cavifrons.* The tooth was, therefore, sent to Doctor Case for direct comparison. He has kindly reported that the styles of *S. cavifrons* stand out 5 mm. from the excavation forming the outer face of the front lobe; while in the Afton tooth this distance is only 3 mm. Also, the inner wall of the fossettes of the molars of *S. cavifrons* is angular, while in *S. promptus* they are broadly rounded.

The writer has not seen the materials forming the type of Mr. Barnum Brown's *Symbos australis.*[2] However, the second molar, the type of this species, is considerably smaller, the length at the base being given as only 32 mm.; the width, 30 mm. The third molar would probably not have been wider. The inner face of the hinder lobe of *S. promptus* is considerably more flattened than in *S. australis*. The parastyle of the latter appears to be less prominent than in *S. promptus*. Also, the outer face of the anterior lobe of *S. australis* is not so deeply excavated as in the tooth from Afton; so that in the former the rib on the middle of the face stands out beyond the parastyle; in the Afton species, not so far as the parastyle. It may be noted that the two teeth compared are worn down almost exactly the same amount.

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[1] Occ. Papers Mus. Zool. Univ. Mich., No. 13, 1915.

[2] Mem. Amer. Mus. Nat. Hist., vol. 9, 1908, p. 203, pl. 22.

Besides the upper tooth, there is preserved a part of an atlas (Cat. No. 9121) which is referred provisionally to this species. It is quite unlike the same bone in *Bison* and resembles that of *Ovibos*. The atlas of *Ovibos* differs from that of *Bison* in being of heavier construction, almost all parts of the bone being thicker than the corresponding parts in *Bison*. Below the spinal canal the atlas from Afton is 44 mm. thick; in *Bison*, 35 mm. On each side there is a broad and deep notch at the outer end of the cavity for the corresponding occipital condyle; in *Bison* this is absent or of trifling depth. The spinal canal is smaller than in *Bison*. In *Ovibos* there is, in front of and just below the spinal canal, a median tuberosity that is not present in *Bison*. The cavities for the occipital condyles are not so deep as in *Bison*.

In the fossil atlas the arches are missing and the bone has been eroded. In general the vertebra agrees with that of *Ovibos;* but the hinder end of the spinal canal measures transversely about 50 mm., instead of 40 mm., as in *Ovibos*. The anteroposterior extent of the bone in the midline below is 67 mm.; in *Ovibos*, only 46 mm. The lateral extent of the bone was originally 200 mm. or more.

The cervical vertebra (pl. 8, figs. 4–6) is regarded as being the fifth. The neural spine is eroded off, as well as the transverse processes. The bone has so many points of agreement with the corresponding one of *Ovibos moschatus* that the relationship is undoubted. The anterior articular end of the centrum is similarly convex; the hinder one similarly concave. As in *Ovibos*, the foramina for the vertebrarterial arteries are reduced in diameter. In the vertebra at hand the foramina have a diameter of only 4 mm. They are on a level with the floor of the spinal canal; in *Ovibos* much below this position. The height of the centrum, from the floor of the spinal canal to the lower surface in front, is 61 mm.; the width, taken at the level of the spinal canal is 92 mm.; the length, taken between the centers of the two ends, 54 mm. The spinal canal is oval, 30 mm. high and 24 mm. wide.

The dorsal vertebrae appear to have belonged near the front of the series, but they are so extensively damaged that exactitude can not be attained. There is so much difference in size that they may have belonged to different individuals, but their color and manner of fossilization appear to associate them. One of these (pl. 8, figs. 1, 2) has the rear of the centrum 70 mm. deep, 95 mm. wide, and 53 mm. long. Apparently the neural arches stood on pedicels, which remain and show a deep pit. The other dorsal has part of the arch remaining, but the spine and most of the lateral processes are gone. The depth of the centrum is 56 mm.; the width, at the level of the spinal canal, 73 mm.; the length, 55 mm.

The lumbar vertebra (pl. 8, fig. 3) appears to belong about the middle of the series. It has lost the neural arch and the lateral processes, but the centrum is well preserved. The articular ends are nearly flat. The length is 59 mm.; the height behind is 54 mm.; the width 56 mm. between the ends the bone is somewhat constricted. The spinal canal is 25 mm. wide. This lumbar differs from those of *Ovibos* in being higher than wide; the fourth of *O. moschatus* being 37 mm. high and 55 mm. wide.

BISON, sp. indet.

Remains of one or more species of *Bison* were found in the excavation at Afton. Among these remains are upper and lower teeth, incisors, premolars, and molars. Probably some of them belonged to the existing bison, but others pretty certainly to one or more extinct species. Inasmuch as no horn cores were found, the species can not be determined. Eight teeth (Cat. No. 9122), belonging to at least two individuals, are regarded especially as being those of an extinct species. They appear to be well mineralized and they have the enamel blackened. They are fully as large as the largest teeth of the existing buffalo. In the department of anthropology there are other similar teeth. Other teeth present little evidence of any considerable geological age, but this may be deceptive.

There are present also an anterior left cannon bone (Cat. No. 9124), a tibia (Cat. No. 9119), and an astragulus (Cat. No. 9127), all of which are apparently fossilized and are heavy and contain little animal matter.

BISON BISON (Linnaeus).

In the spring at Afton there was found a nearly complete skull, which evidently was that of a cow bison of the existing species. The bone is not greatly changed from its original condition. Among the loose teeth are some which are white and fresh in appearance and which are probably those of *Bison bison*. Others more or less stained with iron and more mineralized must for the present remain unidentified. The skull belongs in the department of anthropology.

Family ELEPHANTIDAE.

MAMMUT AMERICANUM (Kerr).

In Professor Holmes's paper of 1903 it was said that he took from the spring at Afton at least 100 mastodon teeth. Many of these are in the collections at the United States National Museum. Some were illustrated in Holmes's report on plates 6 and 7. Figures of some have been published by the present writer.[1] All of these teeth are stained brown or black and appear to have lost practically all of their animal matter. The pores, however, are not filled with mineral matter, and broken surfaces adhere strongly to the tongue.

ELEPHAS COLUMBI Falconer.

In the department of paleontology in the United States National Museum are about a dozen teeth of this species which were secured in the spring near Afton. These teeth include upper and lower teeth of both the milk and the molar series. Some of them are finely preserved. They are usually stained black and show the presence of but little animal matter. Some are so thoroughly mineralized that they ring on being struck. One of these teeth was figured by Prof. W. H. Holmes in 1903 [2] and by Dr. F. A. Lucas.[3] Others have been illustrated by the present writer.[4] Other teeth from this locality are in the department of anthropology in the United States National Museum.

ELEPHAS IMPERATOR Leidy.

In the United States National Museum there are three fine molars of this species which were found in the spring near Afton. One of these teeth, an upper last molar, was figured by Holmes in 1903;[5] and a lower molar was illustrated by two figures on his plate 8. The same teeth were described by the present writer in 1914.[6] Apparently there was only one other tooth of this species found by Holmes; these teeth therefore being presumably rarer than those of *E. columbi.*

In the Dyar Museum, Public Library, Kansas City, Missouri, is a lower jaw which appears to belong to this species. In each ramus there is a well-worn molar, apparently the second. The specimen was presented by Mr. R. H. Harper, and was probably found in the spring explored later by Professor Holmes.

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[1] Geol. Surv. Ind., vol. 36; Iowa Geol. Surv., vol. 23.

[2] Rep. U. S. Nat. Museum for 1901, pl. 9, lower fig.

[3] Md. Geol. Surv., Pleistocene, vol. 38.

[4] Geol. Surv. Ind., vol. 36; Iowa Geol. Surv., vol. 23.

[5] Rep. U. S. Nat. Mus. for 1901, pl. 9, upper fig.

[6] Iowa Geol. Surv., vol. 23, p. 422, pls. 66, 67.

Family CASTOROIDIDAE.

CASTOROIDES OHIOENSIS Foster.

Nothing of this species has been secured from Afton except a fragment of an incisor (Cat. No. 9126).

Family CANIDAE.

CANIS NUBILUS (Say).

In the department of anthropology in the United States National Museum is a skull of a wolf that may be referred to the large species now inhabiting that region. It is white and presents no evidences of great geological age, but no certain conclusions can be drawn as to the length of time it had been buried there. Besides the skull there are many teeth and some bones. These wolf remains are in the department of anthropology.

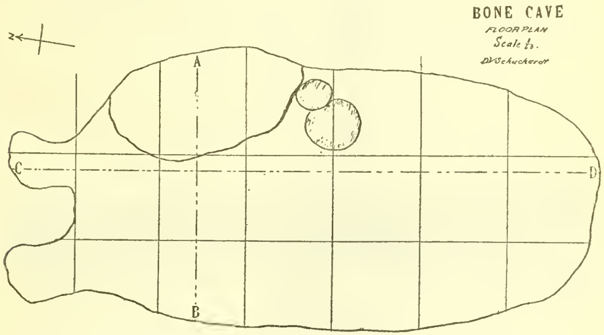

FIG. 1.—FLOOR OF BULVERDE CAVE. THE SQUARES ARE 10 FEET ON EACH SIDE. THE ELLIPTICAL FIGURE INCLOSING A REPRESENTS THE BOTTOM OF THE SHAFT.

CANIS LATRANS Say.

In the collection from Afton there is an axis (Cat. No. 9131) which certainly belonged to this species or to a close relative of it.

6. COLLECTION MADE IN A CAVE NEAR BULVERDE, BEXAR COUNTY, TEXAS.

Within a few miles of the village of Bulverde, Bexar County, Texas, there is a cave which has furnished a considerable number of species of fossil vertebrates. In the month of December, 1915, the writer employed Mr. D. V. Schuchardt, of San Antonio, then a student in the Agricultural and Mechanical College at College Station, to spend some days in making a trial collection. This collection has been presented to the United States National Museum and is described below.

Mr. Schuchardt kindly furnished the writer with plans of the cave, drawn to scale. Although these were not produced with the expectation that they would be published, they are here presented (figs. 1–3), inasmuch as they give a good idea of the size, the form, and the position of the cave. As engraved, 1 inch represents a length of 20 feet. In figure 3 the floor is divided into squares 10 feet on each side.

As Dr. T. W. Vaughan has informed the writer, this cave has been excavated in the Edwards limestone, a member of the Lower Cretaceous. The surface conditions in the neighborhood are not known to the writer. The entrance to the cave is a perpendicular shaft, having a diameter of somewhere about 8 feet and a depth of approximately 35 feet. When the horizontal part of the cave is reached it is found to be nearly 70 feet long and 33 feet wide. The height may be as much as 7 feet, but this varies, being sometimes much less. As represented by Mr. Schuchardt, the floor is covered with a layer of fossil-bearing materials as much as 3 feet in thickness. To what extent the thickness has been determined in different parts of the cave the writer does not know. As shown by the materials sent, this is made up to a great extent of unconsolidated sand and clay; but in places it is cemented together by calcium carbonates and iron oxide; and there appear to be layers of travertine of unknown horizontal

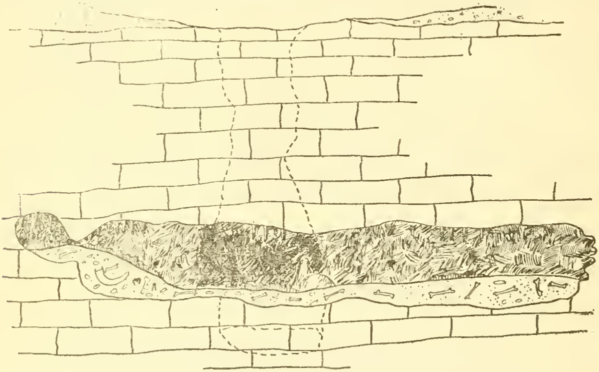

FIG. 2.—A SECTION OF THE CAVE ALONG THE LINE C–D OF FIG. 1.

extent. In these deposits are to be found numbers of bones and teeth, some admirably preserved, but often broken up, as is shown by the fragments of limb bones of large proboscideans.

Usually the bones are entirely free from the matrix, but sometimes they are encrusted by the deposit of travertine. On the walls of the cave and of the shaft leading to it there are, as shown by the drawings, stalactitic deposits. On the floor are blocks of fallen rock. No lower opening from the cave is known, but Mr. Schuchardt suspected that there had been one formerly at the north end; and the heaping up of materials at that end appears to add probability to this view. This or any other opening would, however, probably be, not into the free air, but into other caves. While some bones may have been washed into the cave through such openings, it seems probable that most of the remains are those of animals that fell into the cave through the open shaft.

It is to be hoped that the coming season will be a favorable one, so that Dr. E. H. Sellards, of the Texas Geological Survey, may be able to carry out his plan for working this important deposit. From Mr. Schuchardt's collection there have been determined the following list of fossil vertebrates:

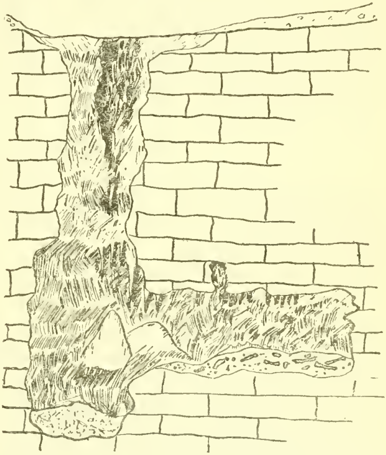

FIG. 3.—A SECTION OF THE CAVE ALONG THE LINE A-B OF FIG. 1.

†*Alisodon mirus*, new genus and species.
†*Terrapene whitneyi.*
†*T. bulverda*, new species.
†*Gopherus atascosae?*
Crotalus atrox?
Didelphis virginiana.
†*Bison*, sp. indet.
†*Mammut americanum.*
†*Elephas primigenius.*
Peromyscus, sp. indet.
Geomys texensis?
Perodipus, sp. indet.
Sylvilagus, sp. indet.
Ursus americanus.
Canis latrans.
†*Aenocyon dirus?*
†*Dinobastis serus.*
†*Felis*, sp. indet.

Of these 18 species those marked by the † may be fairly regarded as extinct. These would constitute 55 per cent of the whole number.

We might conclude therefrom that as a whole the fauna belongs to about the middle of the Pleistocene. Inasmuch as in the list are found no remains of *Elephas imperator*, or of any camels, or of any horses, there seems to be no special reason for holding that it is older. Possibly the shaft had not been opened to the surface during the early Pleistocene.

PISCES.

Family CYPRINIDAE.

ALISODON, new genus.

Type species.—*Alisodon mirus*, new species.

Type formation.—Pleistocene.

Diagnosis.—Pharyngeal teeth in one row, probably 3–3; stalked; the grinding surface expanded and deeply concave.

The name is derived from ῞αλεισον a cup, and ὀδούσ a tooth.

ALISODON MIRUS, new species.

Plate 9, figs. 8–9.

Type specimen.—A pharyngeal bone bearing two teeth (Cat. No. 9219, U.S.N.M.).

Type locality.—Bexar County, Texas.

Type formation.—Pleistocene.

Diagnosis.—Same as for the genus.

In the collection made by Mr. Schuchardt there is a single tooth-bearing pharyngeal bone (Cat. No. 9219) of a cyprinid fish, on which there are retained two teeth (pl. 9, figs. 8, 9.×2). Between these teeth there is a considerable space, which was, in life, probably occupied by another tooth; and on the bone there appears a scar which may mark the place where this tooth was attached. There seems to be no reason for supposing that there was a second row of teeth; hence the tooth formula is probably 3–3. From one extremity of the bone to the other, in a straight line, is 14 mm. The teeth are of unusual form. The larger one consists of a basal pedicel about 3.5 mm. wide and 1.5 mm. thick, and an expanded portion about 4.5 mm. wide. The masticatory surface is deeply concave, with the rim somewhat irregular. The smaller tooth has practically the same form.

The writer has found no reference to similar teeth, except in Day's Fishes of India (vol. 2, p. 555), where the teeth of *Amblypharyngodon melettinus*, a species of southern India, are said to have rather concave summits. In that genus, however, there are three rows of teeth on each pharyngeal.

Alisodon seems to fall into the subfamily Mylopharodontinae[1] and next to the genus *Stypodon*. This genus is described as having teeth of the *Mylocheilus* type, more or less cylindrical, with rounded grinding surfaces. What special use a minnow had for such teeth as those of *Alisodon* it is hard to determine.

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[1] Jordan and Evermann, Bull. 47, U. S. Nat. Mus., p. 202.

REPTILIA.

Family EMYDIDAE.

TERRAPENE WHITNEYI Hay.

This species appears to be represented by a fragment of the upper shell, presenting the region occupied by a part of the first costal scute, and the first, second, third, and a part of the fourth, marginal scute areas; also by an anterior lobe of the plastron, lacking a left hinder corner; and a small part of another anterior lobe. These parts have the catalogue number 9220. When these remains are compared with the fine type of the species, now in the United States National Museum, only apparently unimportant differences are observed.

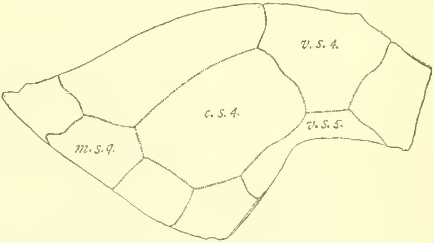

Fig. 4.—Terrapene bulverda. Rear of carapace × 1.

TERRAPENE BULVERDA, new species.

Plate 10, fig. 1.

In the collection are several fragments of one or more species of box tortoise that are not referable with satisfaction to any of the described species. That these fragments belong to one species is doubtful; they certainly belong to more than one individual. It is thought better to give a specific name to the most characteristic piece and to refer the others to it provisionally.

The fragment that is made the type of *T. bulverda* is a part of the hinder half of the carapace, including parts or wholes of the fourth and fifth vertebral scutes, the fourth right and left costal scutes, the left third costal scute, and the eighth, ninth, tenth, and eleventh left marginal scutes.

This box tortoise was a large one. The width at the rear of the lateral hinge lines was not far from 140 mm. The bones are all solidly grown together. To illustrate the form of the various scutes a line drawing (text fig. 4) is provided, which represents them as spread out flat. It will be seen that the fourth vertebral scute is urn-shaped and narrow behind. The width at the widest part preserved is 42 mm. Its length was about 35 mm. The fifth vertebral scute was unusually wide, about 48 mm. The ninth marginal is 23 mm. long and 20 mm. high.

The free border of the carapace is sharp on the tenth and eleventh scute areas, but farther forward it rounds off and thickens. Evidently there was no keel connecting the hinder free border with that in front. At the tenth marginal area the shell is 13 mm. thick. In the region described the free border of the shell is not rolled up, but nearly flat; as is also the underside of the same region. In another fragment the edge along the ninth marginal is slightly turned upward. In *T. whitneyi* the ninth marginal scute on both sides is prolonged upward considerably between the third and the fourth costal scutes; in *H. bulverda* this marginal rises but little between the costal scutes mentioned.

There is present a left xiphiplastral bone which appears to belong to this genus (pl. 10, fig. 1). Indeed, it fits against the part of the carapace just described as if it belonged there originally. While, however, the bones of the carapace are solidly coossified, the xiphiplastral was connected with its fellow and the hypoplastral in front by suture. This bone resembles in many ways the same bone of *Terrapene antipex*.[1] It is however, rather more pointed behind. In *T. antipex* the flattened upper surface of the xiphiplastral, that which in life was covered by horn, terminates mesially abruptly; but in the xiphiplastral here described this surface slopes off gradually into the rest of the bone. In *T. antipex* there was found to be a sharp ridge, a keel, connecting above the bridge the rear free border with that in front. As shown by the type fragment of carapace and another supposed to belong to the same species, there is no trace of such a keel. There is present also a right humerus somewhat larger than that of a good-sized *T. carolina*. It may or may not have belonged to *T. bulverda*. In 1908[2] the writer referred to *T. marnochii* a fine carapace which had been found on San Diego Creek, probably near San Diego, Duval County, Texas. This identification was provisional and somewhat arbitrary. It may yet be shown that the carapace belongs to a distinct species and that the carapace here described as *T. bulverda* is that of *T. marnochii;* or *T. marnochii* may have nc claim to either carapace. Future discoveries alone can remove these doubts.

Family TESTUDINIDAE.

GOPHERUS ATASCOSAE? (Hay).

Testudo atascosae HAY, Foss. Turtles, N. A., p. 467, figs. 627, 628.

In the collection from the cave at Bulverde there is a single femur (Cat. No. 9222), which is referred with doubt to this species.

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[1] Eighth Ann. Rep. Geol. Surv. Fla., 1916, p. 58, pl. 5, fig. 1.

[2] Fossil Turtles North America, p. 360, pl. 58, figs. 1, 2.

Family CROTALIDAE.

CROTALUS ATROX? Baird and Girard.

Plate 10, fig. 2.

In the collection are about 50 vertebrae, most if not all of them belonging to one crotalid snake; also a few ribs and one poison fang. The vertebrae indicate a very large serpent. They have been compared with a skeleton of *Crotalus adamanteus* in the United States National Museum, which was about 6 feet long in life. One of the fossil vertebrae (pl. 10, fig. 2), presenting dorsal and hypapophysial spines, is slightly larger than any in the skeleton referred to. From the extremity of one spine to the other is 29 mm.; measured between lines parallel with the body, 27 mm. The poison fang attached to the maxilla belonged to a much smaller snake, but probably of the same species. There is also a left ramus of the mandible, minus the dentary.

MAMMALIA.

Family DIDELPHIDAE.

DIDELPHIS VIRGINIANA Kerr.

Of the Virginia opossum there have been secured a supraoccipital bone; two lower canines, a right and left, probably of one individual; an atlas and a fifth cervical; a right humerus, lacking both extremities; and the upper half of the left tibia. These have the catalogue number 9224.

Family BOVIDAE.

BISON, sp. indet.

An indeterminable species of the genus *Bison* is included in the collection made by Mr. Schuchardt. It is represented by a single lumbar vertebra (Cat. No. 9225). It is heavy and thoroughly fossilized.

Family ELEPHANTIDAE.

MAMMUT AMERICANUM (Kerr).

Plate 10, fig. 8.

In the collection sent by Mr. Schuchardt is the anterior end of what appears to be a hindermost milk molar of this species. It presents two transverse crests, which are wholly unworn (Cat. No. 9226). The owner of the tooth was a quite young mastodon.

In the collection is a left tibia (pl. 10, fig. 8. Cat. No. 9227) which is regarded as belonging to a young animal of this species. Both epiphyses are wanting, and the inner condyle is broken off.

The total length of the bone, measured in front, is 220 mm. The side-to-side diameter at the middle of the shaft is 53 mm.; the fore-and-aft, 43 mm. This is to be compared with the measurements of a similar bone of *Elephas primigenius*, as given below.

ELEPHAS PRIMIGENIUS Blumenbach.

Plate 9, figs. 1–7; plate 10, figs. 3–7; plate 11, figs. 1–6.

The most important part of the collection sent from Bulverde cave by Mr. Schuchardt consists of elephant remains which the writer has been compelled to refer to that widespread and variable species *Elephas primigenius*. These remains consist of a part of a right maxilla, which bears the third (penultimate) and part of the fourth (ultimate) milk molars of one individual (Cat. No. 9229); the right second and third milk molars in a fragment of the maxilla; the detached upper left third milk molar; a detached lower second milk molar and a detached lower third, apparently right, milk molar, all of a second individual (Cat. No. 9230). There are also fragments of milk molars of other young elephants.

The maxilla and its contained teeth (pl. 9, fig. 1; pl. 11, fig. 5) are to be described first. The underside of the fragment is buried in the mingled clay and gravel of the bottom of the cave. The upper surface is covered by an incrustation of clay, calcium carbonate, and iron oxide. The front of the penultimate milk molar has been slightly damaged in front, but it still presents five plates and the hinder talon. It had been worn back to the talon, and it shows well the thin and plicated enamel. Five plates occupy a line 44 mm. long. The width of the tooth is 37 mm.

The hindermost milk molar is represented by five plates and the anterior talon. It had not been touched by wear, and the grinding surface was almost hidden in cement. The writer has ground down somewhat the front of the tooth in order to show the enamel. The figures give a view of the inner face of the teeth and maxilla and a view of the grinding surfaces. The five enamel plates and the intervening plates of cement of the hindermost milk tooth are spanned by a line 52 mm. long. There would thus be 9.6 of these plates in a line 100 mm. long. In case the tooth originally had 12 plates, as is probable, its length must have been close to 130 mm. The width is 49 mm.; the height of the fourth plate, 78 mm. Of the upper hindermost milk molar of *E. primigenius* the writer has at hand no good examples, but its size may be judged pretty well from specimens of the corresponding lower teeth of Alaskan specimen. One of these has been described and figured.[1] It is estimated to have had a length of about 110 mm., but it may have been longer. The same milk molar in a lower jaw from Siberia (No. 8858, U.S.N.M.), with apparently one plate and the talon missing in front, was close to 105 mm. in length, 40 mm. in width, and 60 mm. in height. Twelve plates are counted. The upper fourth milk molar referred to *E. primigenius* is represented by No. 4836 of the United States National Museum, sent from Waverly, Ohio.[1] It is estimated to have been about 120 mm. long. Its width is 62 mm.; its height at the fifth plate is 110 mm. It is possible, however, that this tooth is the first true molar; but, in any case, it has thinner ridge plates (10 in a 100 mm. line) and the enamel is thinner. It resembles specimens of elephant teeth from Alaska. An upper hindermost milk molar having coarser plates than that of our Bulverde specimen is illustrated in A. Leith Adams' work.[2] At the same time, it is a narrower tooth.

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[1] Iowa Geol. Rep., vol. 23, p. 403, pl. 54, fig. 9.

The Bulverde teeth which belonged to the other and younger individuals may now be described. The second upper milk molar (pl. 9, figs. 5, 6) is small. It has been slightly damaged in front; but there appear to have been only two ridge plates and an anterior and a posterior talon. The length was only about 17 mm.; the width is 13 mm. The fine upper third milk molars have been only slightly affected by wear (pl. 9, figs. 3, 4, 5, 6; pl. 11, fig. 1). They measure 72 mm. in length, 43 mm. in width, and 48 mm. in height. There are eight plates and front and rear talons. The lower third milk molar, worn back only to the fourth plate, is 70 mm. long, 37 mm. wide, and 46 mm. high (pl. 9, fig. 2; pl. 11, figs. 3, 4). It narrows toward the front end. Here, again, are eight plates and front and rear talons. Only the bases of the two roots had been formed, as is the case also with the upper teeth. In both the upper and the lower third milk teeth there are the bases of two roots—a smaller one in front supporting two plates of the upper teeth and three of the lower one, and a larger hinder root for the other plates. In the lower tooth (pl. 11, fig. 4) the interval between the two roots is situated below nearly the middle of the length of the crown; in the upper tooth (pl. 11. fig. 2) it is nearer the front of the tooth.

Good specimens of the penultimate milk molars, upper and lower, of *Elephas primigenius* are rare objects. The writer is now much in doubt about the identity of a supposed lower tooth of this order described[3] from Alaska. It is almost certainly a much worn fourth milk tooth. For information we must at present depend on teeth described by A. Leith Adams in his work above cited. Those varied from 39 mm. in length and 21 mm. in width of crown, to 83 mm. and 35 mm, respectively. The average was 56 mm. in length and 31 mm. in width. The teeth from Texas fall within these limits. Adams gives illustrations of a number of these milk molars, upper and lower. A lower second (antepenultimate) milk molar accompanied the teeth of the young individual. A section was made and polished in order to show the structure (pl. 9, fig. 7). There appear to be present three plates and front and rear talons. The crown is 19 mm. long and 15 mm. wide. The penultimate milk molars above described have lost much of their cement. There are present the hinder halves of the upper third milk teeth of two other individuals, both having the same white color as the teeth just described. One of these (pl. 11, fig. 6. Cat. No. 9232) preserves the cement between its plates. There are in the collection several fragments of other third milk molars, and the writer has seen a similar tooth in the collection of the San Antonio Scientific Society. Indeed, it may be the fellow of the lower milk tooth of the specimen which furnished the two penultimate milk molars and the one lower milk molar.

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[1] Iowa Geol. Rept., vol. 23, p. 402, pl. 54, fig. 6.

[2] Mon. Brit. Foss. Eleph., p. 17, pl. 1, fig. 4.

[3] Iowa Geol. Rept., vol. 23, p. 401, pl. 54, figs. 3, 4.

If the remains just described belong to *Elephas primigenius* and not to an unrecognized species, of whose validity the writer has been unable to persuade himself, the known distribution of this wide-ranging species becomes greatly extended in our country. The writer has referred to *E. primigenius* a large tooth now in the collection at Raleigh, North Carolina, and found a few miles north of Beaufort. In the present paper he figures a fragment of a milk molar which is in the collection from Whitesburg, Tennessee. It is a smaller tooth than those from Bulverde. The writer has had sent to him by Prof. Mark Francis, of College Station, Texas, a lower left penultimate milk molar which was found near Temple, Bell County, Texas. It is 62 mm. long and 32 mm. wide (pl. 10, figs. 3, 4).

The teeth from Bulverde have the ridge plates so much thicker than most specimens from Alaska and Siberia that one is naturally led to inquire whether the former may not belong either to *E. columbi* or to *E. imperator*. Of *E. columbi* Leidy described a second (antepenultimate) milk molar[1] and his figure has been copied by the present writer;[2] but one can hardly rely on teeth of this order in distinguishing species. From Florida Leidy[3] described what he regarded as an upper penultimate milk molar; but his figure, reproduced by the present writer,[4] seems to show the concave surface of wear of a lower tooth. The length of the tooth is 110 mm.; the greatest thickness, 46 mm. This is nearly the size of the hindermost milk molar of the Texas specimen and of others belonging to *E. primigenius*. The present writer has described and figured,[5] as an upper penultimate milk molar of *E. columbi*, a specimen from the phosphate beds of South Carolina. It is a little used tooth and nearly complete. The length was originally a little more than 105 mm. and its thickness is 57 mm. If these teeth really belong to *E. columbi* there is a great disparity in the sizes of the penultimate milk molars of this species and *E. primigenius*, that of *E. columbi* being about as large as the fourth milk molar of *E. primigenius.*

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[1] Trans. Wagner Inst. Sci., vol. 2, p. 17, pl. 3, figs. 6, 7.

[2] Geol. Surv. Iowa, vol. 23, p. 413, pl. 61, figs. 2, 3.

[3] Trans. Wagner Inst. Sci., vol. 2, p. 17.

[4] Geol. Surv. Iowa, vol. 23, pl. 61, figs. 5, 6.

[5] Idem, p. 413, pl. 61, fig. 4

In the Iowa report referred to above[1] the writer described and figured a lower penultimate milk tooth as belonging to *E. columbi.* It had been found at Afton, Oklahoma, where both *E. columbi* and *E. imperator* have been collected. The writer is now inclined to regard the tooth as that of *E. imperator*, partly on account of the size of the tooth and partly because of the thickness of the plates and of the enamel. It is a considerably larger tooth than the corresponding known teeth of *E. columbi* and far larger than that of the teeth from Bulverde.

As more than one other student of elephants, the writer has sometimes been tempted to set off from *Elephas primigenius*, as a distinct species, the form that is found in the United States and southern Canada; but each time that he has approached the subject he has been arrested in the effort to find distinguishing characters.

Two skull bones from Bulverde are referred to the young of this species, but it is possible that they belonged to the mastodon. Figure 1 of plate 10 (Cat. No. 9233) represents, of about one-half the natural size, the left side of the basisphenoid bone. On each side is a large air cavity, which opened below into the hinder end of the nasal passage. Above this are seen openings into other air cells, wholly within the body of the bone. Figure 2 of the same plate gives a view of the inner surface of the right exoccipital (Cat. No. 9234). Four openings to air cells in the bone are seen.

There are present various limb bones of two or more young proboscideans, some of which are referred to the species here described. Others are described above as those of a young mastodon. Among these bones is the base of a left scapula showing the articular cavity. There are also parts of three humeri, all with the epiphyses missing. There appear to be differences among them, but the writer is not able to determine their generic identity.

A left tibia (Cat. No. 9235) of a young animal (pl. 10, fig. 7) is referred to this species. It lacks both the epiphyses. The length, taken in front, is 228 mm. The side-to-side diameter at the middle of the length is 44 mm.; the fore-and-aft diameter, 41 mm. It is thus shown to be a slenderer bone than that of *Mammut americanum* (pl. 10, fig. 8), as recorded under that species. A right tibia (Cat. No. 9236) of a somewhat larger young elephant has lost the upper epiphysis and a part of the lower end of the shaft. Still another tibia (Cat. No. 9237) is represented by the upper two-thirds of the shaft. Its side-to-side diameter is only 40 mm.

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[1] P. 413, pl. 61, figs. 7, 8.

A right femur (Cat. No. 9238) of a young elephant has lost the head of the bone (not yet united to the shaft), the great trochanter, and somewhat of the lower end of the shaft. The total length of the fragment is now 280 mm. It was originally somewhat more than 300 mm. long. Measured across the upper end at the plane of union of the epiphysis with the shaft the width is 103 mm. The greatest diameter at the middle of the shaft is 43 mm.; the least diameter, 33 mm. A left femur (Cat. No. 9239), presenting only the upper half of the shaft, is slightly larger and must have belonged to another individual. These bones are heavy and well mineralized.

A right ulna of a proboscidean, probably an elephant, is represented by the shaft lacking the olecranon and about the lower third of the bone. A left ulna presents about the upper fourth of the bone lacking the olecranon. They probably belonged to one individual and have the catalogue number 9240. The width across the surface for the humerus is 115 mm. The greatest diameter at about the middle of the shaft is 55 mm.; the least, 47 mm.

Three bones of a large elephant (Cat. No. 9246), a dorsal vertebra without its arches and processes, the lower end of a left humerus, and the lower end of the right tibia are in the collection. The vertebral centrum is heart-shaped, the depth from the floor of the spinal canal to the lower border being 125 mm. or more; the width, taken at the bottom of the articular cavities for the ribs, 100 mm. The width across the lower articular surface of the humerus was more than 170 mm. The width of the articular surface for the astragulus was 130 mm.

Family CRICETIDAE.

PEROMYSCUS, sp. indet.

A single lower incisor tooth (Cat. No. 9247) is all in the collection that represents this genus.

Family GEOMYIDAE.

GEOMYS TEXENSIS? C. H. Merriam.

This species is believed to be represented by an upper incisor and the right side of a lower jaw, containing the incisor and part of one molar (Cat. No. 9248).

Family HETEROMYIDAE.

PERODIPUS, sp. indet.

The genus *Perodipus* is represented in the collection by two upper incisors.

Family LEPORIDAE.

SYLVILAGUS?, sp. indet.

Of what is probably a species of *Sylvilagus* there are in the collection a left ramus of a lower jaw, with molars and part of the incisor, another incisor, and a front molar (Cat. No. 9248).

Family URSIDAE.

URSUS AMERICANUS? Pallas.

Of the genus *Ursus* there are recognized two damaged humeri, the shaft of one femur, a fibula, and the third and fourth metatarsals, all of which probably belonged to the same individual. The length of the most nearly complete humerus is 300 mm. When compared with the corresponding bones of a recent individual of *U. americanus* no important differences are observed. However, the metatarsals are relatively more slender than in recent specimens observed and are not so straight. The bones are not well fossilized, and little can be said regarding their geological age. They were found in the cave at the end most distant from the entrance. They have the catalogue number 9249.

Family CANIDAE.

CANIS LATRANS Say.

Of apparently this species there are present the proximal half of the right femur and the distal half of the right humerus. These parts are well preserved and appear to have lost all their animal matter, but are not thoroughly mineralized. The two pieces may or may not belong to the same individual. To these have been given the catalogue number 9249.

Between the humerus and that of a specimen (No. 1326) in the United States National Museum there is observed no important difference. In the case of the femur the distance from the inner surface of the head to the outer face of the great trochanter is 33 mm. in both the fossil and a femur (No. 1326) in the existing coyote; but the diameter of the shafts differ, the greatest of the shaft at the middle of the length being, in the existing coyote, 12 mm.; in the fossil 13.6. This difference is probably due to individual variation.

AENOCYON DIRUS? Leidy.

Plate 5, figs. 3–4.

In the collection there is a radius (Cat. No. 9251) of the right side, nearly complete, which belonged to a large species of wolf. It is compared with that of a skeleton of *Canis lupus* from the north of

Sweden, which had a length of about 5 feet 4 inches from tip of nose to tip of tail. In this skeleton the radius is 224 mm. long; the fossil radius is 234 mm. long. It is, moreover, a broader bone relatively to the length. The distal end is 40 mm. wide. The bone is well fossilized.

In the collection there is an upper right canine tooth (Cat. No. 9252) which was found in the cave not far from the radius above described. This tooth (pl. 5, figs. 3, 4) has the same fore-and-aft diameter at the base (13 mm.) as has the corresponding tooth of a specimen of *Aenocyon dirus* from Rancho LaBrea, near Los Angeles, California. It is, however, not so thick (9 mm.) as that last-mentioned tooth (10 mm.). The cingulum is strongly developed, especially on the inner side. The root is broad.

It is possible that this tooth and the radius belong to Sellards' *Aenocyon ayersi*, found in Florida.

Family FELIDAE.

DINOBASTIS SERUS, Cope.

Plate 5, figs. 1–2.

The writer has recently recognized the presence of this species in the cave near Bulverde[1] from one of the canine teeth, the property of the San Antonio, Texas, Scientific Society. In the collection made by Mr. Schuchardt there are some remains of a large catlike animal which are referred provisionally to *Dinobastis serus*. These parts consist of a lumbar vertebra, probably the fourth, a nearly complete left femur, a considerable part of the right femur, the upper end of a third femur, a right tibia, a left cuboid, a left second metacarpal, two second phalangeals, and one ungual phalangeal. To these parts have been given the catalogue number 9251 except to the fragment of the upper end and of a femur. This is differently fossilized and doubtless belonged to another individual. It has the number 9252. The body of the lumbar vertebra is 40 mm. long, 46 mm. wide, and 30 mm. high at the hinder end. The fourth lumbar of a lion is 44 mm. long, 42 mm. wide, and 30 mm. high.

The femur is compared with that of a lion. This in the lion has a length of 315 mm., measured from the upper surface of the head to the lower border of the internal condyle; in the fossil, a length of 303 mm. The shaft, at the middle of the length, is of somewhat greater diameter than in the lion, being from inside to outside, 30 mm. The widths of the two bones from the internal to the external tuberosities is nearly the same; but the anteroposterior diameters of the condyles are very different. In the lion that of the external condyle is 70 mm.; that of the fossil femur, 57 mm. In this respect the femur resembles that of a bear, but it is otherwise quite different.

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[1] Proc. U. S. Nat. Mus., vol. 56, p. 107, pl. 28, fig. 4.

The tibia has lost the external part of the articular surface for the astragulus. The total length is 283 mm. The lower half of the shaft is nearly terete, not triangular in section as in the lion. The front border is considerably concave from one end to the other, as in the lion. In the bear this border is straight. The second metacarpal is 102 mm. long, 23 mm. wide, and 25 mm. deep, proximally. The bone is straight, as in the bear, not curved as in the lion and tiger. It is, however, too large to be the metacarpal of any bear of ordinary size. There are present two second phalangeals that are referred to as the same sabertooth. There is preserved also an ungual phalangeal (pl. 5, figs. 1, 2) which resembles much that of a lion. It is, however, thicker from side to side. There seem likewise to have been no lamellae of bone to cover the base of the horny claw.

FELIS?, sp. indet.

In the collection there is a single lumbar vertebra, probably the fourth, which belonged to some felid much smaller than the one here described as *Dinobastis serus.* The length of the centrum is only 34 mm. The width and height of its hinder end are, respectively, 32 mm. and 19 mm. The outer faces of the neural arches are more nearly perpendicular than in the lumbar of the supposed *Dinobastis.* This vertebra can not belong to *Felis couguar*, for the lumbars of this are at once longer and narrower and have the zygapophyses more widely separated.

EXPLANATION OF PLATES.

PLATE 3.

FIGS. 1–3.—*Testudo munda.* × 1. Type.
- 1. Left second peripheral.
- 2. Right seventh peripheral.
- 3. Fragments of the plastron showing hypoplastrals and xiphiplastrals.

FIGS. 4–11.—*Tapirus tennesseae.* Upper and lower teeth. × 1. Type.
- 4. Upper right third premolar.
- 5. Upper right second molar.
- 6. Lower left second premolar.
- 7. Lower right third premolar.
- 8. Lower right fourth premolar.
- 9. Lower right second molar.
- 10. Lower left third molar.
- 11. Lower incisor.

FIGS. 12–13.—*Mylohyus nasutus.* × 1.
- 12. Upper left canine; inner face.
- 13. Upper right canine; inner face.

FIGS. 14–15.—*Sangamona fugitiva.* Second molar. × 1. Type.
- 14. View of grinding surface.
- 15. View of outer face.

Fig. 16.—*Elephas primigenius.* Rear of penultimate milk molar. × 1.

Figs. 17–20.—*Ursus floridanus.* Teeth. × 1.
- 17. Lower right first molar.
- 18. Lower left first molar.
- 19. Upper left third molar.
- 20. Upper left third molar.

Figs. 21–23.—*Platygonus setiger*, new species. Lower canine. × 1. Type.
- 21. Side view.
- 22. Section at base of crown.
- 23. View of hinder face.

Plate 4.

Fig. 1.—*Equus giganteus?* Upper left second premolar. View of grinding surface. × 1.

Figs. 2, 3.—*Mylohyus nasutus.* Two lower left canines. × 1.
- 2. Presenting outer face.
- 3. Presenting inner face.

Figs. 4–13.—*Mylohyus exortivus.* Teeth. × 1.
- 4. Lower left molars.
- 5. Lower left third premolar.
- 6. Lower left first molar, unworn.
- 7. Lower left second molar, unworn.
- 8. Upper right second, third, and fourth premolars.
- 9. Upper right premolars, fourth.
- 10. Upper left fourth premolar.
- 11. Upper left first molar, worn.
- 12. Upper right second molar, unworn.
- 13. Upper right second premolar.

Figs. 14, 15.—*Mylohyus obtusidens.* Upper and lower canines. × 1.
- 14. Upper canine, showing inner face.
- 15. Lower left canine, showing inner face.

Figs. 16, 17.—*Platygonus tetragonus?* Right canine.
- 16. View of inner face. × 1.
- 17. Cross section at lower fracture. × 2.

Figs. 18, 19.—*Platygonus vetus?* Teeth. × 1.
- 18. Lower left first and second molars.
- 19. Section of lower canine.

Fig. 20.—*Sciurus tenuidens.* Upper incisor. × 1. Type.

Figs. 21, 22.—*Smilodontopsis mooreheadi.* Upper right sectorial tooth. × 1. Type.
- 21. View of lingual (inner) surface.
- 22. View of cutting surface.

Fig. 23.—Same species? as figures 21, 22. × 1. Left upper canine.

Figs. 24–26.—*Aenocyon ayersi?* Teeth. × 1.
- 24. Upper right third premolar, inner face.
- 25. Upper right second premolar, outer face.
- 26. Upper left third premolar, outer face.

Plate 5.

Figs. 1, 2.—*?Dinobastis serus.* Ungual phalange. × 1.
- 1. Side view.
- 2. View of rear.

Figs. 3, 4.—*Aenocyon dirus?* Canine tooth. × 1.
- 3. View of lingual face.
- 4. View of median face.

FIGS. 5, 6.—*Sangamona fugitiva.* Part of lower jaw and teeth. × 1.
5. View of inner face.
6. View of grinding surface.

FIGS. 7–11.—*Taurotragus americanus.* Teeth. × 1.
7. Lower right fourth milk molar, inner face.
8. Lower left first molar, inner face.
9. Lower right second molar, inner face.
10. Lower left hindermost molar, inner face.
11. Upper right second molar, outer face.

PLATE 6.

FIGS. 1, 2, 5–8.—*Cervalces roosevelti?* Teeth × 1.
1. Lower left second and third molars. Inner faces.
2. Same teeth, showing grinding surfaces.
5. Incisor, showing lingual face.
6. Same tooth, showing lateral face.
7. Upper left second and third molars, showing the grinding surfaces.
8. Same teeth, outer faces.

FIGS. 3, 4.—*Alces americanus.* Incisor. × 1.
3. View of lateral face.
4. View of lingual face.

FIGS. 9, 10.—*Symbos promptus.* Type. Third molar. × 1.
9. View of grinding surface.
10. View of outer face.

PLATE 7.

FIG. 1.—*Equus complicatus* Leidy. × 1. Lower right second to fourth premolars.

FIG. 2.—*Equus hatcheri* Hay. × 1. An upper left first or second molar, showing a polished transverse section.

FIGS. 3–8.—*Camelops nitidus*, new species. Lower left teeth. × 1.
3. Inner face of first molar. Type.
4. Grinding face of same tooth.
5. Inner face of second molar.
6. Grinding face of same tooth.
7. Grinding face of fourth premolar.
8. Same tooth, showing inner face.

FIGS. 9–12.—*Equus holmesi*, new species. Teeth. × 1.
9. Upper right fourth premolar; outer face.
10. Upper right second molar; outer face.
11. Upper right fourth premolar; grinding surface.
12. Upper right second molar; grinding surface.

PLATE 8.

FIGS. 1–6.—*Symbos promptus?* Vertebrae × ½.
1. Dorsal vertebra, seen from above.
2. Same vertebra, seen from in front.
3. Lumbar vertebra, seen from in front.
4. Cervical, the fifth?, seen from the left side.
5. Same vertebra, seen from in front.
6. Same vertebra seen from behind. *r. h.*, position of pit for head of rib; *t. v.*, position of transverse process; *v. a.*, vertebrarterial foramen.

PLATE 9.

FIGS. 1–7.—*Elephas primigenius* × 1.

1. View of grinding surfaces of third and fourth milk molars.
2. Lower right second milk molar, presenting the grinding surface.
3. Upper left third milk molar, seen from behind.
4. Same tooth, showing grinding surface.
5. Right maxilla, showing the grinding surfaces.
6. Same object, with second and third milk molars, seen from without.
7. Lower second milk molar, showing a polished section.

FIGS. 8–9.—*Alisodon mirus*. Pharyngeal bone. × 2. Type.

8. View showing grinding surfaces of the teeth.
9. View of outer aspect of bone and teeth.

PLATE 10.

FIG. 1.—*Terrapene bulverda?* Left xiphiplastral bone, showing upper surface. × 1.

FIG. 2.—*Crotalus atrox?* Side view of one vertebra. × 1.

FIGS. 3–7.—*Elephas primigenius?* Young animals.

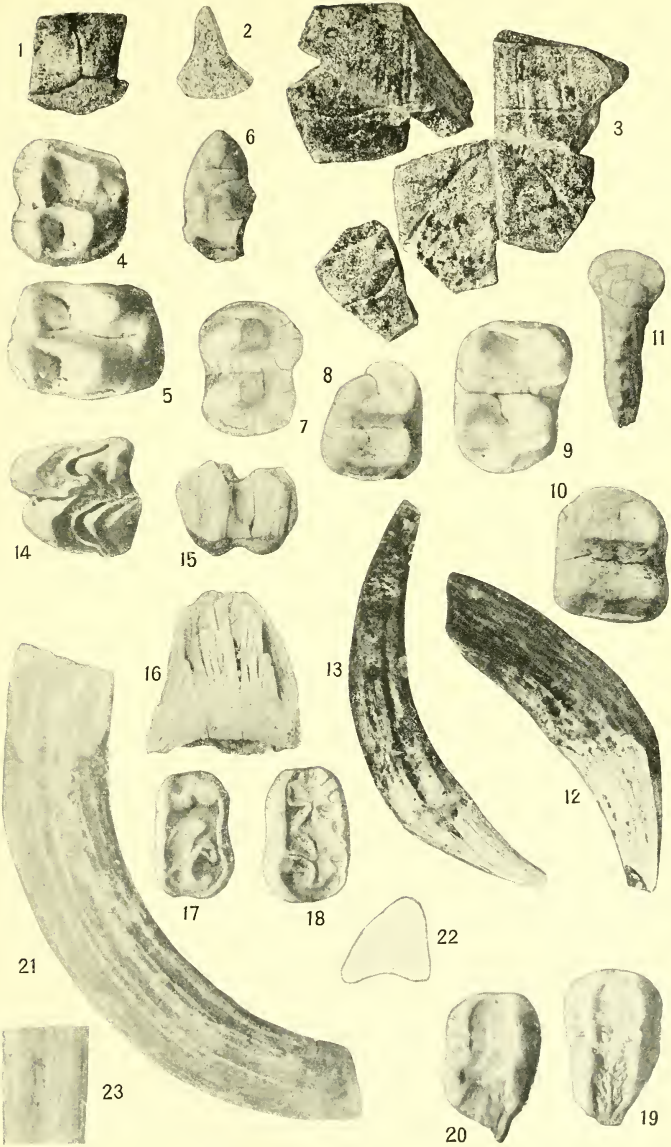
3. Lower left third milk molar from Temple, Texas. View of inner face. × 1.
4. Same tooth. View of outer face.
5. Basisphenoid seen from the left side. × ½.
6. Left exoccipital, showing inner surface. × ½.
7. Left tibia, lacking the epiphyses. × .35.

FIG. 8.—*Mammut americanum*. Tibia of young animal, lacking the epiphyses. × .35.

PLATE 11.

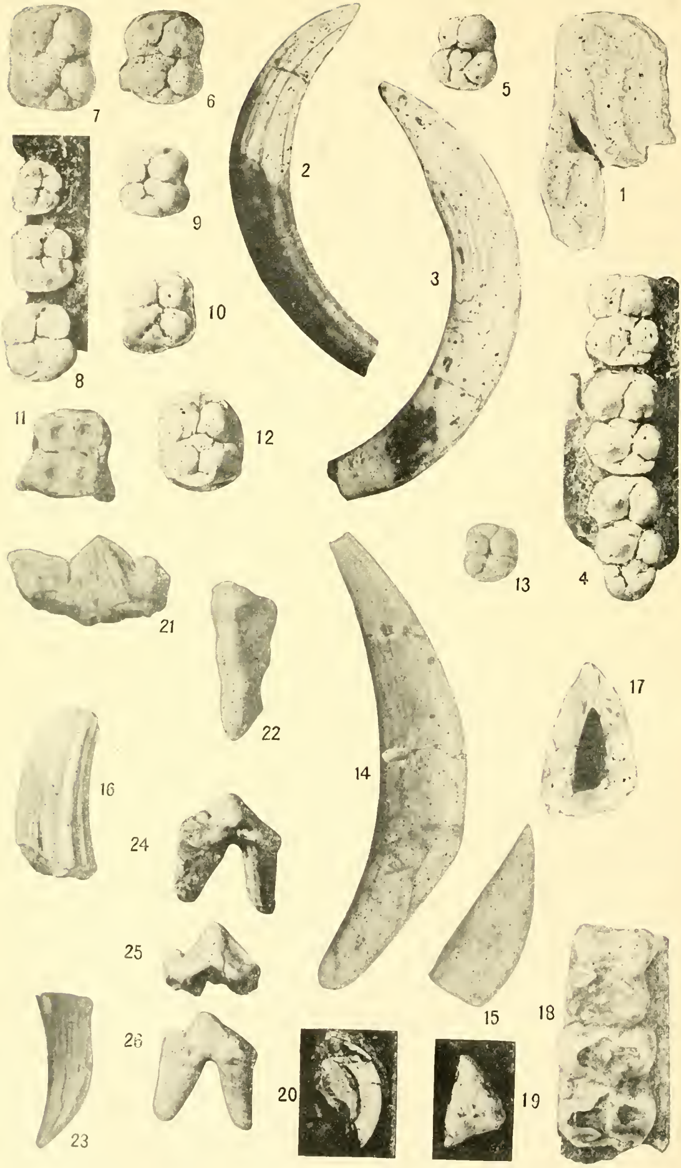
FIGS. 1–6.—*Elephas primigenius*. Teeth.

1. Left upper third milk molar, showing outer face and part of anterior root. × 1.
2. Same tooth, seen from below, to show bases of roots. × ¾.
3. Left lower third milk molar, seen from without. × 1.
4. Same tooth from below, to show bases of the roots. × ¾.
5. Maxilla with third milk molar and part of the fourth. View from within. × ½.
6. Part of an upper third milk molar, with its coat of cement. × 1.



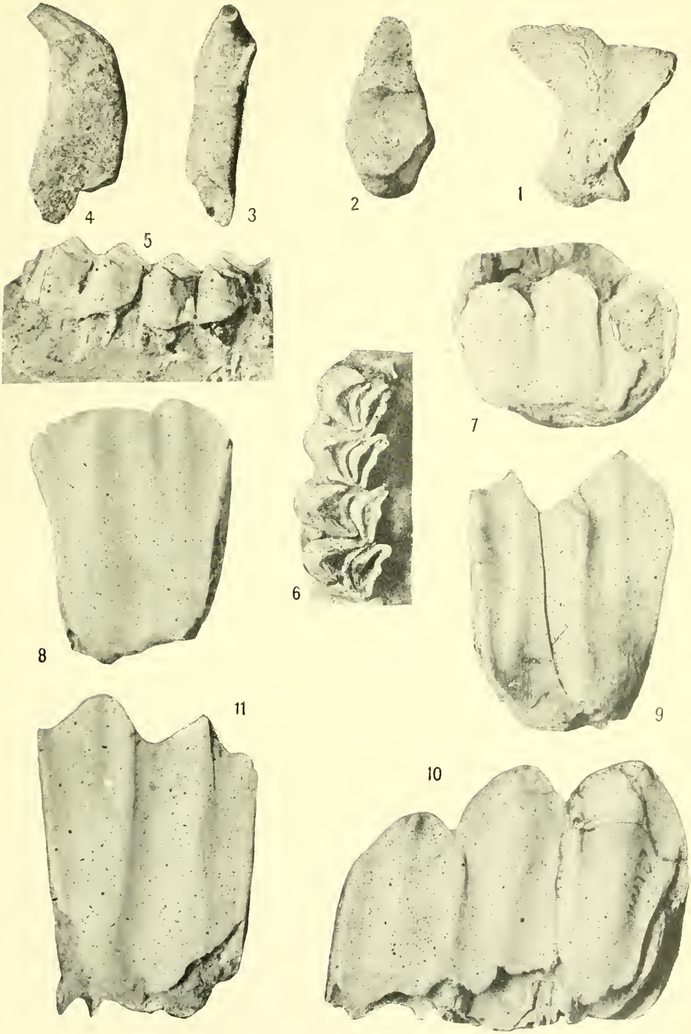
VERTEBRATE FOSSILS FROM THE PLEISTOCENE OF MARYLAND AND TENNESSEE.

FOR EXPLANATION OF PLATE SEE PAGES 143 AND 144.



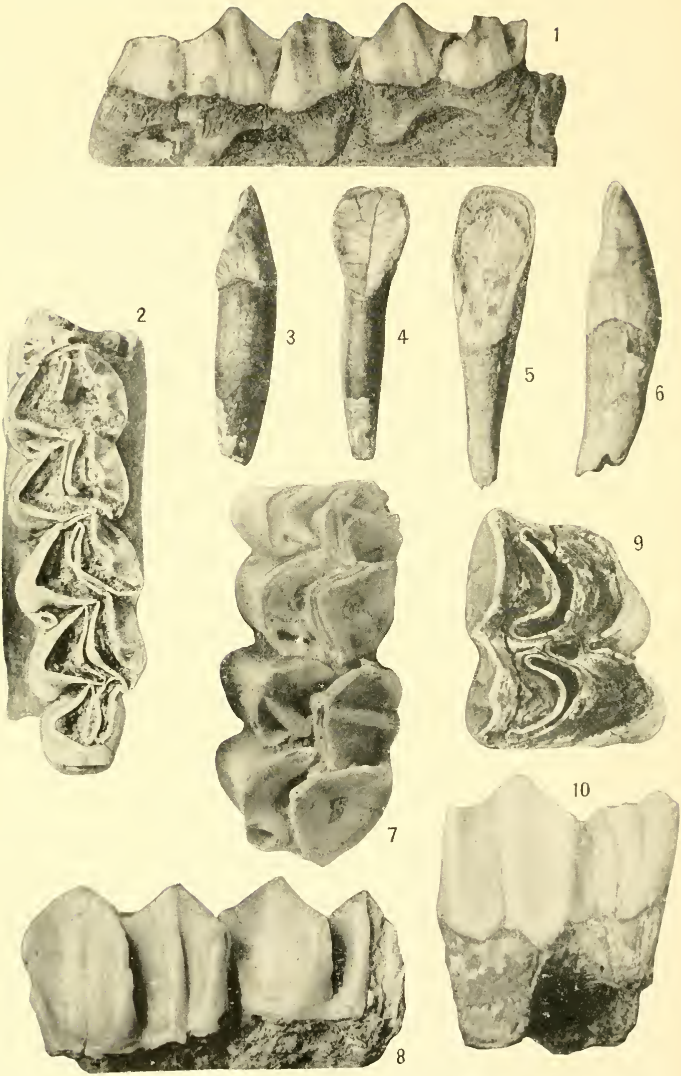
Vertebrate Fossils from the Pleistocene of Maryland and Tennessee.

For explanation of plate see page 144.



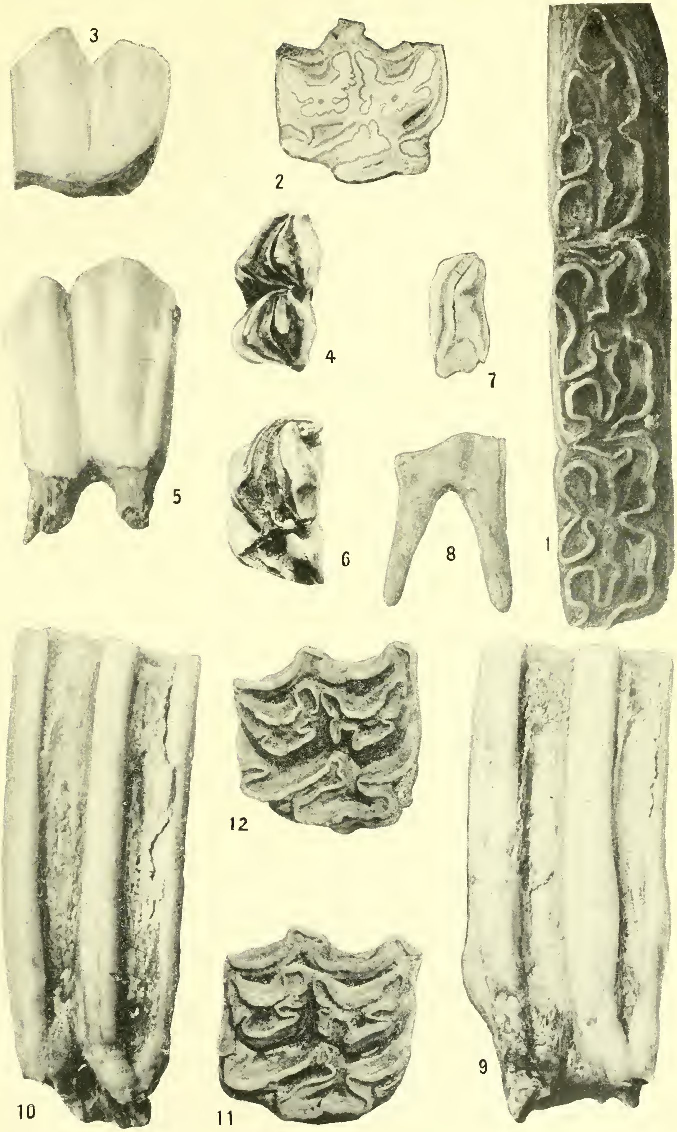
VERTEBRATE FOSSILS FROM THE PLEISTOCENE OF ILLINOIS AND TEXAS.

FOR EXPLANATION OF PLATE SEE PAGES 144 AND 145



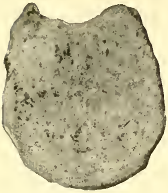
VERTEBRATE FOSSILS FROM THE PLEISTOCENE OF ILLINOIS AND OKLAHOMA.

FOR EXPLANATION OF PLATE SEE PAGE 145.



VERTEBRATE FOSSILS FROM THE PLEISTOCENE OF OKLAHOMA.

FOR EXPLANATION OF PLATE SEE PAGE 145.



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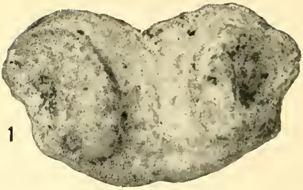

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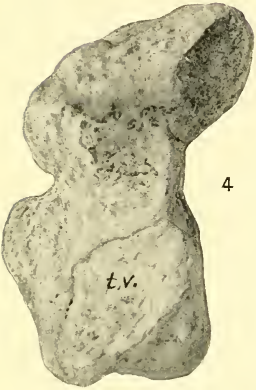

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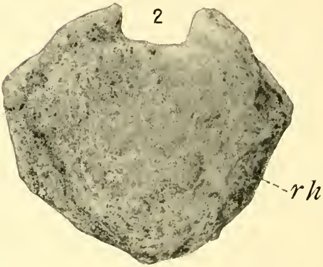

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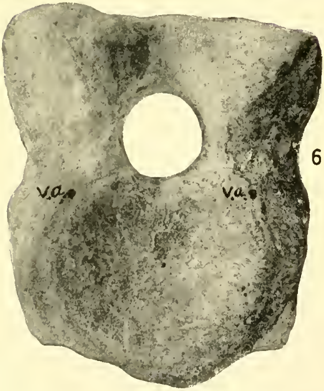

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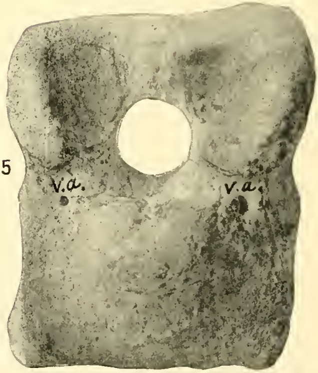

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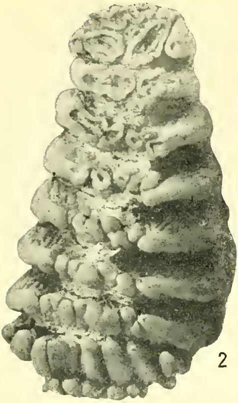
VERTEBRAE OF SYMBOS PROMPTUS?

FOR EXPLANATION OF PLATE SEE PAGE 146.



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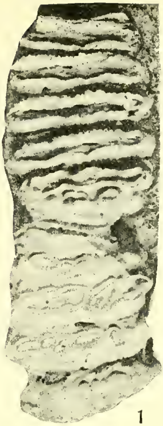

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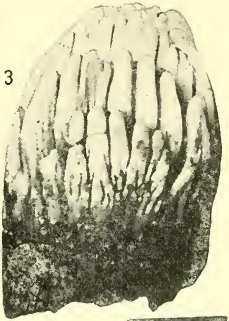

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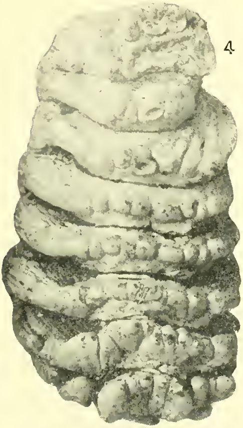

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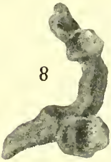

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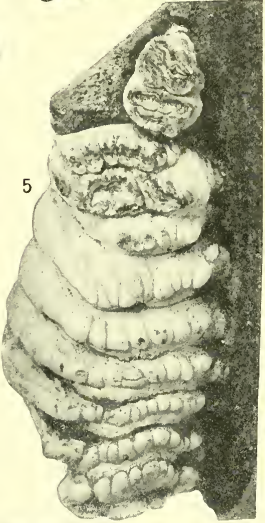

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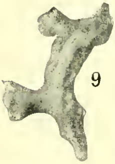

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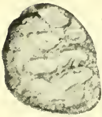

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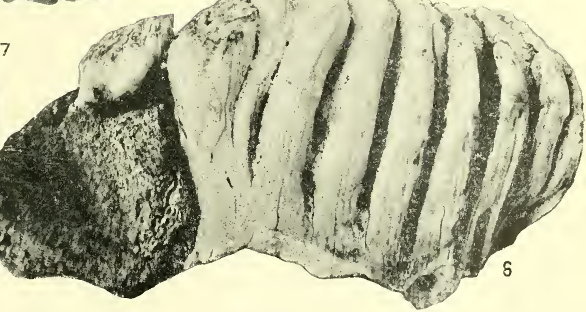
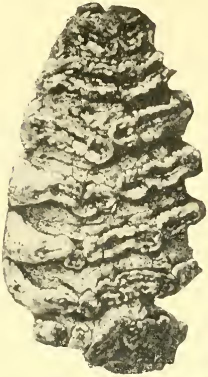


6

Vertebrate Fossils from the Pleistocene of Texas.

For explanation of plate see page 146.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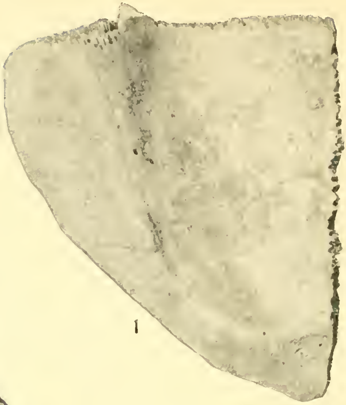
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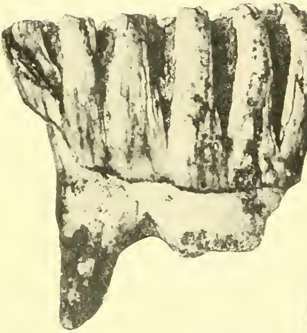
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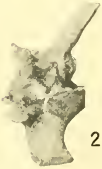
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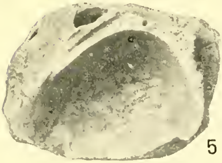
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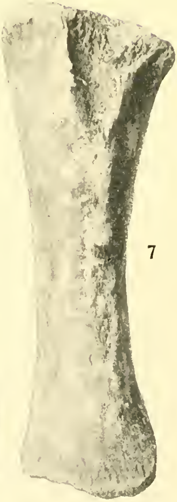
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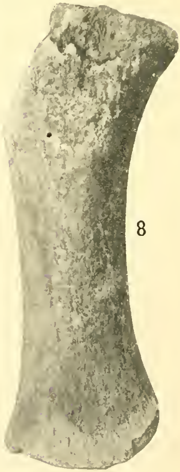
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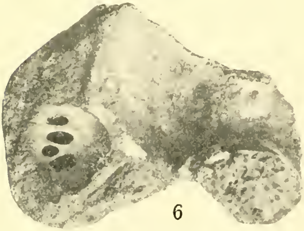
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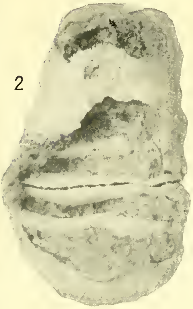
Vertebrate Fossils from the Pleistocene of Texas.

For explanation of plate see page 146.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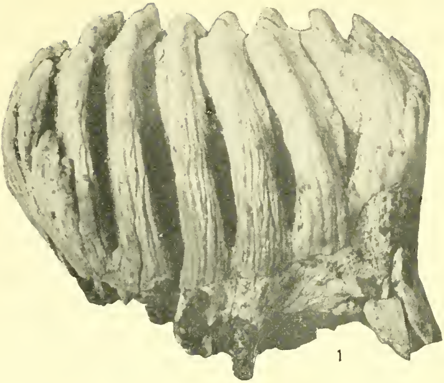
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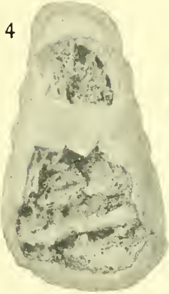
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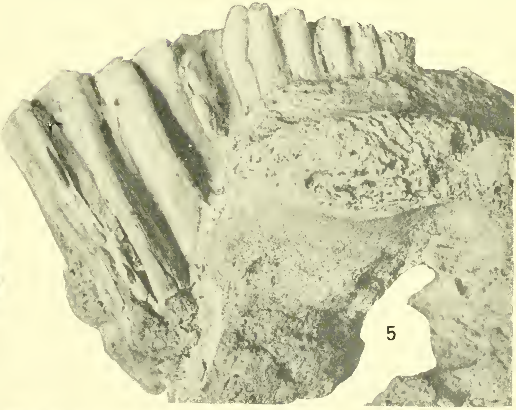
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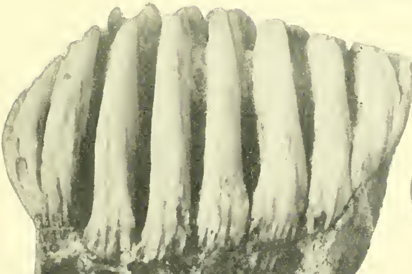
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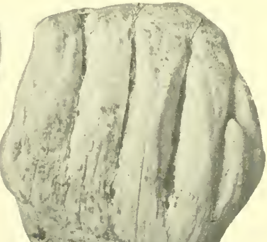
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TEETH OF ELEPHAS PRIMIGENIUS FROM PLEISTOCENE OF TEXAS.

FOR EXPLANATION OF PLATE SEE PAGE 146.

THE CHEMICAL COMPOSITION OF HYDROTALCITE AND THE HYDROTALCITE GROUP OF MINERALS.

By William F. Foshag,

Of the Department of Geology, United States National Museum.

The hydrotalcite group as here considered comprises the minerals hydrotalcite, pyroaurite, stichtite, and brugnatellite. Of these hydrotalcite and pyroaurite have been long known but their true chemical nature remained hidden. They have been considered hydrated oxides, a considerable and rather constant carbon dioxide content having been entirely disregarded. New analyses of hydrotalcite and stichtite are here presented. Further analyses are necessary before the chemical composition of this group can be definitely established. Before any definite conclusions can be drawn from any analysis, however, the homogeneity of the material, as determined under the petrographical microscope, must be established.

HYDROTALCITE.

Hochstetter, Journ. Prakt. Chem., vol. 27, p. 378, 1842.
Hermann, Journ. Prakt. Chem., vol. 40, p. 11, 1847.
Hermann, Journ. Prakt. Chem., vol. 46, p. 257, 1849.
Shepard, Amer. Journ. Sci., vol. 12, p. 209, 1851.
Johnson, Amer. Journ. Sci., vol. 12, p. 361, 1851.

Hydrotalcite was first described by Hochstetter from the Shishimsk District in the Urals, where it occurred implanted on schist. It was later described from Snarum, Norway, under the name volknerite. Hydrotalcite from Kongsberg, Norway (U. S. Nat. Mus., No. 13191), was selected for analysis. The material consisted of curved lamellar masses of a white color and pearly luster. Under the microscope the material is made up of basal cleavages with refractive index about 1.510. Sections normal to the basal cleavage showed a birefringence of low order. The material was very pure, only a few grains of foreign material appearing. The results of an analysis on this material and another partial analysis, together with the calculated ratios, are given in the following table:

Proceedings U. S. National Museum, Vol. 58—No. 2329.

Analyses and ratios of hydrotalcite.

Constituents.	Per cent.	Per cent.	Ratios.	
SiO_2	0.44			
Al_2O_3	15.32	17.60	1.00	1×1.00
Fe_2O_3	1.89			
CaO	None.			
MgO	39.72	40.40	6.1	6×1.00
FeO	.28			
CO_2	7.60	7.60	1.07	1×1.07
H_2O	35.46	35.75	12.4	12×1.03
	100.71			

This leads to the formula $6MgO.Al_2O_3.CO_2.12H_2O$ or $MgCO_3.5Mg(OH)_2.2Al(OH)_3.4H_2O$.

Pyrognostics.—Before the blowpipe the mineral glows with intense light, but does not fuse, and becomes silvery white. Heated in a closed tube it decrepitates, gives abundant water, and turns silvery white. It is easily soluble in acids, leaving a slight residue.

The mineral houghite described by C. U. Shepard from St. Lawrence County, New York, is probably hydrotalcite, as pointed out by J. D. Dana. In appearance it is very similar to the hydrotalcite from Norway. Under the microscope it shows a weak birefringence and an index of refraction of about 1.510. The material is considerably intermixed with spinel and other minerals, so that a chemical analysis would lead to no definite results. The analyses by Johnson, therefore, can mean but little. The mineral is derived from spinel.

STICHTITE.

Petterd, Cat. of the Minerals of Tasmania, p. 167, 1910.
Ward, Cat. of the Minerals of Tasmania, p. 169, 1910.
Hezner, Centralbl. f. Min., etc., p. 18, 1912.
Himmelbauer, Tsch. Min. u. Pet. Mitth., vol. 31, p. 32, 1912.
Tasmanian Dept. of Mines, Geol. Surv. Record No. 2, 1914.

This mineral was described by Petterd first as kammererite and later as a new mineral. It occurs in irregular masses, veins, and blebs in a yellowish green serpentine, near the Adelaide Mine at Dundas, Tasmania. The color is lilac weathering to brown. It is foliated in character and has an oily luster. Under the microscope the mineral shows a fibrous structure radially disposed about nuclei of chromite. The two analyses of the mineral are widely divergent and lead to quite different ratios. In neither case is there any mention of the homogeneity of the material analyzed as determined under the petrographical microscope. These analyses are given below.

The new analysis was made upon material in the type collection of the United States National Museum (No. 87454, gift of Robert Sticht). It was crushed and examined under the microscope for homogeneity. The only foreign material detected was the chromite. The mineral was easily soluble in hydrochloric acid with effervescence, and left, beside a residue of chromite, a small amount of flocculent silica. The solution was evaporated to dryness and the separated silica filtered off. The iron, aluminum, and chromium were separated from the magnesia by a double precipitation with ammonium hydroxide. The filtered hydroxides were fused with sodium carbonate, the fusion leached with hot water, the residue dissolved, and the iron precipitated twice. The aluminum was precipitated from the solution after the oxidization of the chromium by evaporation of the filtrate with nitric acid and potassium chlorate. The chromium was reduced by evaporation with hydrochloric acid and alcohol and precipitated twice with ammonium hydroxide. The carbon dioxide was determined by absorption in a potash bulb and the water by Penfield's method.

Analyses and ratios of stichtite.

Constituents.	Petterd.	Ratios.		
SiO_2				
Fe_2O_3	9.0	0.050	0.76	1×.76
Cr_2O_3	11.5	.075		
FeO				
MgO	36.0	.900	5.5	5×1.1
CO_2	7.2	.164	1.00	1×1.00
H_2O	36.1	2.00	12.2	12×1.01
	99.8			

Constituents.	Hezner.	Recalc. per cent.	Ratios.		
SiO_2	3.87				
Fe_2O_3					
Cr_2O_3	20.44	21.28	0.140	1.00	1×1.00
FeO	1.1	1.14	.016	7.02	7×1.03
MgO	37.12	38.67	.967		
CO_2	10.45	10.88	.248	1.77	1×1.77
H_2O	27.26	28.39	1.56	11.14	11×1.01
	100.24				

Analyses and ratios of stichtite—Continued.

Constituents.	Original per cent.	Recalc. per cent.	Ratios.		
SiO_2	2.09				
Fe_2O_3	4.04	4.14	0.025	1.00	1×1.00
Al_2O_3	2.24	2.28	.022		
Cr_2O_3	14.08	14.36	.095		
CaO	Trace.				
MgO	36.59	37.33	.937	6.00	6×1.00
FeO	.28				
CO_2	6.94	7.08	.160	1.13	1×1.13
H_2O	33.01	33.78	1.87	13.2	12×1.10
	99.27				

This leads to the formula, $6MgO. R_2O_3. CO_2. 12H_2O$. The above analyses show some differences, but the results are sufficiently close to $6MgO. R_2O_3. CO_2. 12H_2O$ to be satisfactory. Below are repeated the analyses as compared with the composition required by the formula. In the case of Petterd's and the new analyses the differences are not great.

Analyses and calculated composition of stichtite.

Constituents.	Theory (per cent).	Hezner (per cent).	Petterd (per cent).	Foshag (per cent).
SiO_2		3.87		2.09
Cr_2O_3	23.39	20.44	11.5	14.08
Fe_2O_3			9.0	4.04
Al_2O_3				2.24
FeO		1.10		.28
MgO	38.51	37.12	36.0	36.59
CO_2	6.75	10.45	7.2	6.94
H_2O	34.57	27.26	36.1	33.01

Pyrognostics.—Before the blowpipe stichtite glows with intense light, turns light gray, and becomes magnetic, but does not fuse. Heated in a closed tube the mineral turns gray and then brown, gives abundant water, and becomes magnetic.

PYROAURITE.

Igelström, Ofv. Ak. Stockh., vol. 22, p. 608, 1865.
Sjögren, Geol. Inst. Univ. Upsala, vol. 2, p. 59, 1894.
Flink, Geol. Inst. Univ. Upsala, vol. 5, p. 87, 1900.

The mineral pyroaurite was first discovered at Långban by Igelstrom who gave its composition as $Fe_2O_3. 6MgO. 15H_2O$. Sjögren first described the crystallography of this mineral from material from the Moss mine in Nordmarken. Analysis of material from Långban gave Igelström the following results:

Analyses and ratios of pyroaurite from Långban.

Constituents.	Per cent.	Ratios.		
Fe_2O_3	23.92	0.149	1	1 x 1.00
MgO	34.04	.805	5.4	5 x 1.08
CO_2	7.24	.165	1.11	1 x 1.11
H_2O	34.54	2.14	14	14 x 1.00
	99.74			

Since FeO was not determined in the original analysis some of the mineral from Långban in the United States National Museum (No. 93013) was analyzed for ferrous iron, with the result, FeO, 0.74 per cent. The pyroaurite from Långban, however, is described as opaque even under the microscope, indicating that some alteration had taken place. The above-mentioned specimen in the United States National Museum consisted of large hexagonal platy crystals, which, under the microscope, showed an index of refraction of approximately 1.55 and weak birefringence. The sections of the crystals do not show uniform extinction, but extinguish as a mass of randomly oriented plates, suggesting perhaps that they are pseudomorphic.

The pyroaurite from Moss mine gave Sjögren on a 0.0205 g. portion the results tabulated below:

Analyses and ratios of pyroaurite from Mossgrufa.

Constituents.	Per cent.	Ratios.		
Insol	0.5	....	....	....
Fe_2O_3	22.0	0.14	1.0	1 x 1.00
MnO	4.5	.06	6.5	6 x 1.09
MgO	34.8	.86		
H_2O	36.1	2.01	14.13	14 x 1.01
	97.9			

The H_2O was determined by ignition loss and no doubt includes some of the CO_2. FeO was not determined. Both of the above analyses are very unsatisfactory, but indicate that the formula of pyroaurite is very probably $6MgO. R_2O_3. CO_2. 12H_2O$.[1]

The considerable content of MnO in Sjögren's analysis is worthy of note and indicates that a manganese member of the series may exist.

Heddle described a mineral as pyroaurite from the Island of Haaf Grunay. It occurred as thin seams in yellow serpentine. The analyses, while agreeing well with the theoretical values required by the formula $6MgO.\ R_2O_3.\ 15H_2O$. were made upon impure material. If the determination of the carbon dioxide content is correct the mineral can not be pyroaurite. It is probably a mixture of hydromagnesite, brucite, and limonite.

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[1] An analysis of pyroaurite by Mauzelius (Arkiv for Kemi. Min. ock Geol., vol. 3, No. 3, 1910), has been overlooked. Fe_2O_3, 23.20, MnO 0.21, MgO 35.08, CaO 0.54, H_2O 33.69, SiO_2 0.29, CO_2 6.91. Sum 99.97. This analysis leads to the formula for pyroaurite given.

Sjögren points out the crystallographic similarity between pyroaurite and chalcophanite. The value for *c* for pyroaurite is given as 3.6072, calculated from the angle $10\bar{1}0{:}10\bar{1}1=76°\ 30'$ while *c* for chalcophanite is given as 3.5267 from $10\bar{1}0{:}10\bar{1}1=76°\ 12'$. Chalcophanite is a mineral very likely to occur at Långban, at least the manganese member, and it is possible that pyroaurite is derived from it. Since chalcophanite is derived from franklinite or jacobsite we have the interesting genetic relations—hydrotalcite from spinel, stichtite from chromite, pyroaurite from jacobsite through chalcophanite.

Pyrognostics.—Before the blowpipe the mineral turns golden brown, becomes magnetic, but does not fuse. In a closed tube it turns brown, then golden brown, gives abundant water, and becomes magnetic.

BRUGNATELLITE.

Artini, Real. Acc. Linc., vol. 18, p. 3, 1909.

Pelloux, Museo Civico di Storia Naturale, Genova, vol. 46, p. 34, 1913.

Brugnatellite was described in 1909 as a new mineral by Artini. It occurs at an old asbestos mine in the Val Malenco. Artini's analysis is the only one available and the material was carefully examined under the microscope and found to be homogeneous and free from artinite, hydromagnesite, brucite, etc., and with but a trace of serpentine. Artini's analysis is given below:

Analyses and ratios of brugnatellite.

Constituents.	Per cent.	Ratios.		
Insol	1.03	....	....	....
Fe_2O_3	13.20	0.080	0.45	½ x .90
MnO	1.80	.025	6.2	6 x 1.03
MgO	42.79	1.07		
CO_2	7.78	.177	1.00	1 x 1.00
H_2O	33.77	1.87	10.6	10 x 1.06
	100.37			

These ratios give the formula $6MgO.\ \frac{1}{2}R_2O_3.\ CO_2.\ 10\frac{1}{2}HO_2$. which may be written $MgCO_3.\ 5Mg(OH)_2.\ Fe(OH)_3.\ 4R_2O$. This corresponds to pyroaurite, less one molecule of $Fe(OH)_3$.

However, if we consider one molecule of $Fe(OH)_3$ replaced by its equivalent of magnesia—that is, $1\frac{1}{2}\ Mg(OH)_2$—we get a formula requiring a composition given below:

Comparison of analyses of brugnatellite with values to suit formulas.

Constituents.	Artini's.	$MgCO_3.5Mg(OH)_2Fe(OH)_3.4H_2O$.	$MgCO_3.5Mg(OH)_2 1\frac{1}{2}Mg(OH)_2Fe(OH)_3.4H_2O$.
Fe_2O_3	13.39	14.41	12.40
MgO	44.45	43.62	46.87
CO_2	7.89	7.93	6.87
H_2O	34.27	34.04	33.75

Which of these formulas is the correct one, or whether brugnatellite is identical with pyroaurite can only be determined by additional analyses.

Pyrognostics.—Before the blowpipe the mineral turns golden yellow, but does not fuse and becomes magnetic. In the closed tube it turns black, then golden yellow; yields considerable water, and becomes magnetic.

Pelloux describes a mineral from Mount Ramazzo as brugnatellite, but gives no analysis. Specimens from this locality in the United States National Museum (No. 93008) show a light brown, pearly mineral with an index of refraction of about 1.536, and very low birefringence, not pleochroic. This material is too scanty and impure for an analysis.

A comparison of the properties of these minerals further brings out the isomorphous relationship:

Comparison of properties of minerals of the hydrotalcite group.

Hydrotalcite.	Pyroaurite.	Stichtite.	Brugnatellite.
White	Light brown	Lavender purple	Rose, light brown.
Translucent	Translucent	Translucent	Translucent.
Uniaxial	Uniaxial	Uniaxial	Uniaxial.
Cleavage basal	Cleavage basal	Cleavage basal	Cleavage basal.
Sp. gr. 2.04–2.09	Sp. gr. 2.07	Sp. gr. 2.12	Sp. gr.
n. 1.510	*n*. 1.55 (approx.)	*n*. 1.542	*n*. 1.533.
Biref weak	Biref weak	Biref. 10.026	
Pleochroism, none	Pleochroism, none	Very slightly pleochroic.	Pleochroic.

SUMMARY.

The formula for the hydrotalcite group of minerals is shown to be $MgCO_3.\ 5Mg(OH)_2.\ 2R(OH)_3.\ 4H_2O$, and the present members are hydrotalcite, $MgCO_3.\ 5Mg(OH)_2.\ 2Al(OH)_3.\ 4H_2O$; stichtite, $MgCO_3.\ 5Mg(OH)_2.\ 2Cr(OH)_3.\ 4H_2O$; pyroaurite, $MgCO_3.\ 5Mg(OH)_2.\ 2Fe(OH)_3.\ 4H_2O$.

The chemical composition of brugnatellite and its relation to the other minerals of this group remains in doubt.

The three members have apparently the same mode of genesis and result from the alteration of the corresponding members of the spinel group.

THE DIPTEROUS GENUS ZYGOTHRICA OF WIEDEMANN.

A. H. STURTEVANT,
Of Columbia University, New York City.

In the year 1830 Wiedemann[1] described a Brazilian fly under the name of *Achias dispar*, the genus *Achias* being placed in the family Diopsidae. This species was so placed on account of its broad head with conically produced eyes. Wiedemann stated that this character is much more marked in the male than in the female. In the same year he published a revision of the species of the genus *Achias*, in which he made *A. dispar* the only species of a new genus, called *Zygothrica*.[2]

Two years later Gray[3] published a figure of the species. It was again figured by Macquart.[4] Macquart[5] discussed the species, and placed it doubtfully in his family Lauxaniidae. It does not seem certain from his account that he had seen a specimen. The figure is perhaps a copy of that of Gray, and the description may have been taken from that of Wiedemann.

The next reference to *Zygothrica* was by Loew.[6] He had seen a specimen that was perhaps *Z. dispar*, and on the basis of that specimen referred the genus doubtfully to the Drosophilidae. Bigot[7] tabled the genus among the Diopsidae, apparently without having seen it. Osten Sacken[8] stated that he had seen a specimen that made on him the impression of a Drosophilid.

Hendel[9] mentioned the genus in connection with *Plagiocephalus* Wiedemann. The latter is an Ortalid genus that was also based on a Brazilian species first described by Wiedemann as an *Achias*. Hendel had apparently not seen *Zygothrica*, but suspected that it might possibly be an Ortalid. Two years later, however,[10] he had seen specimens from Peru that he identified as *Z. dispar.* He referred the genus to the Drosophilidae, and redescribed and figured it. Later[1] he added a few notes, attributed Wiedemann's figure to Meigen.

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[1] Aussereurop. Zweifl., vol. 2, p. 556.
[2] Achias Dipt., Genus 16, p. 3.
[3] Animal Kingdom, vol. 2, p. 774, 1832.
[4] Dipt. Exot., vol. 2, pt. 3, pl. 34, fig. 2, 1843.
[5] Idem., p. 409.
[6] Mon. N. Amer. Dipt., vol. 3, p. 23, 1873.
[7] Annales, p. 91, 1880.
[8] Dipt. Malay Arch., p. 90, 1881.
[9] Gen. Insect., p. 113, fasc. 52, 1911.
[10] Deutsch. Ent. Zeit., p. 633, 1913.

De Meijere[2] compared the genus with his new genus *Sphyrnoceps*, which he concluded is distinct because neither sex has as broad a head as that of the male of *Zygothrica dispar.* Both *Zygothrica* and *Sphyrnoceps* are referred to later by de Meijere[3], and Hendel's figure is reproduced.[4]

I have recently examined a large series of specimens in the United States National Museum that are evidently *Zygothrica dispar* Wiedemann, to which species they were tentatively referred by the late Mr. F. Knab. These leave no doubt that the reference to the Drosophilinae is correct. Since they come from Panama, they add another genus to the "North American" list. Both sexes agree in having a very long proboscis, that has not been described by earlier authors. It is sometimes retracted and not easily observed, which probably accounts for this oversight. The females agree well with the description of *Drosophilura caudata* Hendel.[5] This genus (and species) was based on female specimens from Bolivia, while Hendel had seen only males from Peru that he referred to *Zygothrica dispar.* The most striking character described for *Drosophilura* is the long proboscis, which Hendel had overlooked in his males. Another difference is that *Zygothrica* is stated to have two orbital bristles, *Drosphilura* three. Just this sexual difference occurs in the series of specimens that I have examined.

There is another species in the same lot that I have here described as a new species of *Zygothrica.* In this form both sexes have the head shaped as it is in the female of *Z. dispar.* I can find no other significant difference between the two forms, and therefore have put them in the same genus. This makes it probable that *Sphyrnoceps* de Meijere is a synonym of *Zygothrica;* but a more detailed description, especially of the structure of the proboscis, will be necessary before this conclusion can be adopted as certain.

We may tabulate and define the genus as follows:

Genus ZYGOTHRICA Wiedemann.

Zygothrica WIEDEMANN, 1830, Achias Dipt., Genus 16, p. 3.
Drosophilura HENDEL, 1913, Ent. Mitth., vol. 2, p. 387.
?*Sphyrnoceps* de MEIJERE, 1915, Tijds. v. Ent., vol. 58, suppl., p. 58.

Arista plumose; two or three orbitals; vibrissae present; postverticals large; face prominent; carina large; head broader than thorax;

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[1] Abhandl. k. k. zool.-bot. Ges., vol. 8, p. 219, 1914.

[2] Tijds. v. Ent., vol. 58, suppl., p. 59, 1915.

[3] Diptera, in Bronn's Klassen und Ordnungen 5, vol. 3, p. 45, 1916.

[4] Idem, pl. 2, fig. 13.

[5] Ent. Mitth., vol. 2, p. 387, 1913.

proboscis longer than head is high; no prescutellars; preapicals evident on second and third tibiae; discal and second basal cells confluent; costal vein reaches to apex of fourth vein.

Wings clear; eyes laterally produced to a sharp horizontal edge in the male; mesonotum brown ---------- *Z. dispar.*
Wings ornamented; eyes of male not produced; mesonotum shining black ---------- *Z. aldrichii.*
Wings clear; eyes not produced in the male; mesonotum brown *Z. (?) brunnea.*

ZYGOTHRICA DISPAR Wiedemann.

Drosophilura caudata HENDEL, Ent. Mitth., vol. 2, 1913, p. 387.

Both sexes have been fully described by Hendel. The preapicals are evident on the second and third tibiae; other than this his descriptions fit the material I have seen. The species is, however, variable in color. The descriptions of this character given by Wiedemann and by Hendel in his two papers can all be matched in the series, but the darker types are most frequent.

Specimens examined: Trinidad River (over 150 specimens, 11 of them bred from "white toadstool"), Alajuelo (4 specimens), Panama (A. Busck).

Recorded from Peru (Hendel), Bolivia (Hendel), and Brazil (Wiedemann).

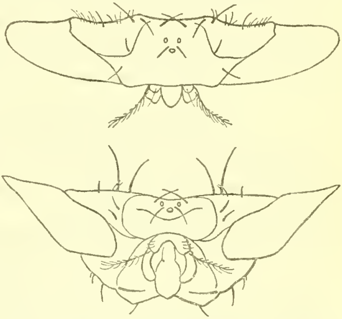

FIG. 1.—ZYGOTHRICA DISPER WIEDEMANN. UPPER, HEAD OF MALE FROM ABOVE; LOWER, HEAD OF MALE FROM IN FRONT AND A LITTLE BELOW.

ZYGOTHRICA ALDRICHII, new species.

Male.—Arista with about six branches above and two below. Antennae yellowish brown. Front about half width of head above, narrower below. Three orbital bristles. Front shining yellow below; orbits and triangle reddish brown, frontal lines black. Postverticals large. Eyes nearly bare. Carina large. Face protuberant, yellow. One large oral bristle. Proboscis longer than height of head; it and palpi yellow. Cheeks yellow.

Acrostichal hairs in six rows. Mesonotum and scutellum shining black. Pleurae and legs pale yellow.

Abdomen shining black.

Wings with three black spots—a basal one extending on the costal margin to just beyond the apex of the first vein, and reaching to the fifth vein, thus including the anterior crossvein; one on the anterior margin extending from a point above the posterior crossvein to the apex of the fourth vein; one around the posterior crossvein. Costa with a break at the humeral crossvein and another one just before the apex of the first vein. Costal index about 1.9; fourth vein index about 1.3; 5x index about 1; 4c index about 0.8. First posterior cell slightly narrowed at its apex.

Length, 2.5 mm.

Type.—Male, Cat. No. 22725, U.S.N.M., from Trinidad River, Panama (A. Busck).

Female.—Proboscis, lower part of pleurae, and second and third coxae shining blackish brown. Otherwise as above.

Allotype.—Same locality as type.

Paratypes.—Thirty-one specimens taken with the type and allotype. Three of these were bred from " white toadstool." This series was taken with the large series of *Z dispar* referred to above. Some of the paratypes are distinctly paler in color than the type, apparently having been pinned when younger. In these specimens the wing spots are smaller or even absent, and the mesonotum, scutellum, and abdomen are brownish or yellowish.

The species is named for Prof. J. M. Aldrich, to whom I am indebted for several of the references to the genus and for other favors.

(SPHYRNOCEPS) ZYGOTHRICA (?) BRUNNEA deMeijere.

Sphyrnoceps brunnea DEMEIJERE, Tijds. v. Ent., vol. 58, 1915, suppl., p. 58.

Eyes rounded in both sexes. Thorax, dark brown above, pale yellow below. Wings clear.

Described from the island of Simalu, off Sumatra.

NOTE.

Since the foregoing was written I have examined a series of specimens taken on a decaying agaric on rotten log, at Emperor Valley, Port of Spain, Trinidad, West Indies; January, 1913, by Prof. Roland Thaxter. This series, which is preserved in alcohol, includes numerous specimens of *Zygothrica dispar* and of *Z. aldrichii.* An examination of the specimens of *Z. dispar* and reexamination of some of the United States National Museum material shows that the males of this species are quite variable in the structure of the head. A few of them have rounded eyes and three orbital bristles, exactly as in the females. There is a continuous series connecting these forms with those that have very long pointed eyes and no second orbital bristle. This observation serves to strengthen the view that *Z. aldrichii* and the genus *Sphyrnoceps* should be placed in the same genus as *Z. dispar.*

THE WEST AMERICAN MOLLUSKS OF THE FAMILIES RISSOELLIDAE AND SYNCERATIDAE, AND THE RISSOID GENUS BARLEEIA.

By Paul Bartsch,
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The present paper discusses several groups of minute West American mollusks which were sadly in need of revision. They are the family Rissoellidae, formerly known as Jeffreysidae. The change of name is required because *Jeffreysia* had to give way to the prior name of *Rissoella.* The family Synceratidae, a new designation for the family Assimineidae, which change is also made necessary because the generic name *Assiminea* has to be replaced by the earlier name *Syncera.* Lastly, the Rissoid genus *Barleeia* has been subjected to a careful examination, which has yielded rather interesting results, as may be seen by an examination of the following pages.

Genus RISSOELLA Gray.[1]

1847. *Rissoella* Gray, Proceedings Zoological Society of London, p. 159.
1850. *Jeffreysia* Alder, in Forbes & Hanley's British Mollusca, vol. 3, p. 151.

Gray, at the above citation, makes the following statement: "*Rissoella*, *Rissoa* sp. Brown. *Rissoa ? glaber*, Alder." *Rissoa glaber* Alder, therefore, is the hologenotype of Rissoella. *Rissoa glaber* Alder, as cited by Gray, was Alder's concept of *Rissoa glabra* Brown at that time, a concept which Alder changed later when he renamed his shell *Rissoa diaphana*, recognizing that it was not the *Rissoa glabra* of Brown. The genotype of *Rissoella*, therefore, is *Rissoa diaphana* Alder, which is also the genotype of the synonym *Jeffreysia.*

Forbes and Hanley publish[2] a description of *Jeffreysia*, which they say was entirely furnished them by Alder. This is of sufficient interest to merit reprinting at the present time:

> Shell spiral, conical or subglobose, thin, transparent; aperture ovate, rounded below, with the peristome thin and entire. Operculum horny, thin, imperfectly ovate, nearly straight on one side; not spiral, but showing faint concentric lines of growth from a lateral nucleus. It is strengthened internally, on the side next the columella of the shell, by a rib with a branch toward the center of the operculum; from this rib rises a strong, projecting plate, set at right angles to the opercular disk.
>
> Animal with four flattish tentacles; the upper pair moderately long, the lower pair rather shorter, and spreading out broad at the base so as to unite with the outline of the head. Eyes placed on the back of the animal, a considerable distance behind the tentacles. They are large and prominent. Oper-

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[1] Trans. Tyneside Nat. Field Club, vol. 1, p. 149, 1847.
[2] British Mollusca, vol. 3, p. 151.

culigerous lobe small and rounded, without filaments or prolonged appendages. Foot oblong, notched and bilobed in front, with a groove down the center, and slightly rounded behind. The armature of the tongue consists of a broad crenulated central tooth, flanked by two lateral ones on each side—the first broad and crenulated, the exterior one small and hooked.

There is no character in the shell of this curious genus by which it can be distinguished from *Rissoa*. In the only two species yet known, both minute, the shell is transparent, and from the remarkable position of the eyes of the animal, so far behind the usual place, and constantly within the shell, its transparency is probably a constant character of the genus, being necessary for the exercise of vision. The lower tentacles may be considered to represent the lobes of the muzzle in *Rissoa*, here elongated into tentacles and covered with vibratile cilia in the same manner with the upper pair. These latter are more flattened and broader than in *Rissoa*.

The operculum is very peculiar. The projecting internal plate I do not recollect to have observed in any other genus, though the spine in *Nerita* approaches to it. It appears from the ridges on its inner surface to afford attachment to a muscle.

Jeffreysia is a littoral genus, found in company with *Rissoa* on small seaweeds in pools between tide marks. Its alliance is evidently with that genus, which in the shell it so strongly resembles; and the lingual armature bears out the affinity, differing but little from that of *Rissoa interrupta* and some of the commoner species. Some others of the small transparent shells usually included under *Rissoa* may probably, when they are obtained alive or with the operculum, be found to belong to this genus.

Four West American species are now referred to this genus. Of two of these the operculum is known so their status may be considered without question. These are *Jeffreysia bifasciata* Carpenter and *Jeffreysia tumens* Carpenter, both of which were described in the Mazatlan Catalogue in 1856. The third species, *Rissoa anguliferens* de Folin, described in Fonds de la Mer in 1870 (vol. 1, p. 134), is placed here provisionally. It seems to belong here, but we have seen no specimens, and de Folin does not describe the operculum; its status, therefore, requires confirmation. Of the fourth species, here described as new, the operculum is also unknown. Its general shape and peculiar umbilicus would place it near *Rissoella tumens* Carpenter.

KEY TO THE WEST AMERICAN RISSOELLAS.

Shell umbilicated.	
Shell smooth	*tumens.*
Shell not smooth but axially threaded	*excolpa.*
Shell not umbilicated.	
Periphery angulated	*anguliferens.*
Periphery not angulated	*bifasciata.*

RISSOELLA TUMENS (Carpenter).

Plate 12, fig. 1.

1856. *Jeffreysia tumens* Carpenter, Cat. Maz. Shells, p. 363.

1857. *Jeffreysia tumens* Carpenter, Rept. Brit. Ass. Adv. Sci. for 1856, pp. 257, 327.

Shell small, subglobular, openly umbilicated, with a slender thread bordering the umbilicus; thin, white, diaphanous, smooth. Nuclear whorls depressed. Whorls four, convex, slightly shouldered at the summit. Aperture suboval. Operculum thin, translucent. To the above description, which is based upon Carpenter's diagnosis and camera lucida figure, Carpenter's remarks, which are as follows, may be added:

> Differs from the least elevated form of *Jeffreysia bifasciata* in its very swelling and somewhat irregular whirls, transparent white texture, and large angulated umbilicus. The operculum, which was found in 5 out of the 13 specimens, is perfectly transparent, appearing black from the remains of the animal, which seems to have been differently colored from that of *J. bifasciata.* Long. .048 (1.2 mm.), long. spir. .026, lat. .038 (95 mm.).
>
> Hab., Mazatlan; very rare, off Chama and Spondylus; Liverpool Col. [British Museum].
>
> Tablet 1719 contains 2 sp.; one young and glossy, with the operculum so situated as to show the medial process; the other adult.

RISSOELLA EXCOLPA, new species.

Plate 12, fig. 3.

Shell small, flesh colored, inflated ovoid. Whorls strongly rounded, appressed at the summit, marked by numerous closely spaced, decidedly retractively slanting axial threads which pass over the inflated and well-rounded periphery as well as the well-rounded base. Base narrowly umbilicated, the posterior edge of the umbilicus slightly angulated. Aperture very broadly oval; posterior angle obtuse; outer lip thin, showing the external sculpture within; inner lip strongly curved and but very slightly reflected; parietal wall covered by a thick callus, which renders the peritreme complete.

The type and two specimens, Cat. No. 267502, U.S.N.M., were collected by the author at head of Concepcion Bay, Lower California. The type has four whorls and measures—length, 2.5 mm.; diameter, 1.8 mm.

Our specimens do not have an operculum, but we are led to believe that they belong to this genus. In general form of outline and also in the matter of umbilicus it suggests *Rissoella tumens* Carpenter. Carpenter's description, however, does not mention the axial thread sculpture and his figure gives a much wider umbilicus than our specimens possess.

RISSOELLA ANGULIFERENS (de Folin).

Plate 12, fig. 9.

1870. *Rissoa anguliferens* DE FOLIN, Fonds de la Mer, vol. 1, p. 134, pl. 20, fig. 6.

Shell small, conic, polished, yellowish brown with a broad whitish band which gradually shades into the darker coloration. Nuclear whorls decidedly depressed, the first almost completely immersed in the second. Postnuclear whorls flattened axially and spirally, minutely striated. Suture very deep, owing to the shoulder of the whorls and the peripheral angle. Periphery decidedly angulated. Base short, moderately rounded with a broad spiral color band on its middle. Aperture subcircular; outer lip thin; inner lip well rounded; parietal wall covered by a thick callus.

The type was described as from Panama Bay. The measurements given for it are: Altitude, 2.5 mm.; diameter, 1.4 mm.

RISSOELLA BIFASCIATA (Carpenter).

Plate 12, fig. 2.

1856. *Jeffreysia bifasciata* Carpenter, Cat. Maz. Shells, p. 362.

1857. *Jeffreysia bifasciata* Carpenter, Rept. Brit. Ass. Adv. Sci., 1856, pp. 257, 327, 366.

1864. *Jeffreysia bifasciata* Carpenter, Rept. Brit. Ass. Adv. Sci., 1863, p. 623.

Shell minute, ovate, very thin, semitranslucent. Nuclear whorl apparently not differentiated from the succeeding turns by sculptural characters or resting mark. Postnuclear whorls inflated, strongly rounded and roundly shouldered at the summit, marked by fine retractively slanting lines of growth only. Suture strongly marked. Periphery inflated, strongly rounded. Base short, strongly rounded. Aperture large, oval, posterior angle nearly obtuse; outer lip decidedly curved, thin; inner lip curved and appressed to the base excepting the anterior third, which is free; parietal wall covered by a thick callus that renders the peristome complete. The shell may be plain white or have a color band or two between summit and suture and one on the base. The bands, when present, are usually only faintly exhibited.

Cat. No. 56354, U.S.N.M., contains a specimen determined by Carpenter, from Mazatlan, which has five whorls and measures—altitude, 1.2 mm.; diameter, 0.8 mm. Cat. No. 16218, U. S. N. M., contains another species from Cape St. Lucas, Lower California, whose operculum shows the typical thin, pale yellow, horny consistency, with the thick ridge on the internal columellar border and the transverse median ridge connecting with this.

Carpenter writes:

> Of this species, beautifully lustrous when viewed under the microscope with a good light, about 90 specimens were obtained, probably from the Algae on the Uvanillae. They are most likely of somewhat sedentary habits, as even in a living state they are not unfrequently incrusted with Coralline. The dried animals have a rich brown color. Several retained their opercula, which are perfectly normal, and of a reddish brown. Long., 1.375 mm.; lat. 0.75 mm.
>
> Hab. Mazatlan; rare, on ? Algae; Liverpool Collection [British Museum].

Tablet 1716 contains three sp. richly colored, of which two retain their opercula.—1717, 3 sp. pale nonbanded variety, one with beautiful incrustation of Coralline.

I fear that the specimens with the red opercula to which he refers are *Barleeias*, probably *Barleeia alderi* Carpenter, which he describes as *Jeffreysia alderi* on the same page on which the present form is diagnosed, for that form resembles the present species quite a bit, but has a thimble-pitted nucleus and a different operculum.

Genus SYNCERA Gray.

1821. *Syncera* GRAY, Med. Repos. London, vol. 15, p. 239.
1830. *Assiminea* JEFFREYS, Trans. Linn. Soc., vol. 16, p. 378.

Shell conic, usually strong. Nuclear whorl smooth, the rest of the shell marked by lines of growth and fine spiral striations only. Outer lip simple; inner lip continuing over the base as a thick parietal callus. Operculum subspiral, thin, horny. Animal with the muzzle deeply notched in front; tentacles two, short, cylindric or club shaped, contractile, bearing the eyes at their tip; respiratory orifice on the right side.

Type, *Syncera hepatica* Gray [=*Assiminea grayana* Leach] *Synceras* are littoral forms, frequently inhabiting the brackish reaches of our coast.

Four species of the genus *Syncera* are known from the West Coast of America at the present time. Two of these, *Syncera translucens* Carpenter and *Syncera compacta* Carpenter, were named by Dr. Philip P. Carpenter in his supplementary report on the present state of our knowledge with regard to the mollusks of the West Coast of of North America, published in the Report of the British Association for the Advancement of Science for 1863. In the same paper he also published *Assiminea subrotundata* Carpenter and ? *Paludinella castanea* Carpenter. Of the latter he states that it "may be an aberrant *Assiminea*." These two have since been transferred to the section of *Algamorda* of the genus *Littorina* by Dr. W. H. Dall.

In 1865 Tryon bestowed the name *Hydrobia californica* Tryon upon the shell previously designated as *Jeffreysia translucens* by Carpenter. It is not strange that Tryon did not recognize this fact, for Carpenter's diagnosis was so terse that it is scarcely recognizable.

The present paper adds two new members to the genus from the West Coast, one from Lower California and the other from Panama.

KEY TO THE WEST AMERICAN SYNCERAS.

- Altitude of adult shell more than 6 mm ---------- *panamensis.*
- Altitude of adult shell less than 3 mm.
  - Shell elongate-ovate ---------- *magdalenensis.*
  - Shell not elongate-ovate
    - Shell broadly ovate ---------- *translucens.*
    - Shell not broadly ovate
      - Shell globular ---------- *compacta.*

SYNCERA PANAMENSIS, new species.

Plate 12, fig. 8.

Shell large, elongate conic, bluish-white, the tip pale horn colored. Nuclear whorls smooth, not differentiated from the succeeding turns. Postnuclear whorls moderately rounded, appressed at the summit, marked by rather strong, irregularly spaced, retractively slanting incremental lines and exceedingly fine microscopic spiral striations. Suture feebly impressed. Periphery of the last whorl rather inflated, obscurely angulated. Base rather long, with a feeble umbilical chink, marked like the spire. Aperture large, oval; posterior angle almost acute; outer lip thick within, thin at the edge; inner lip strongly curved and very strongly reflected, continuing at the insertion into a strong parietal callus, which renders the peritreme complete. Operculum typical.

The type and another specimen, Cat. No. 150870, U.S.N.M., come from Panama. The type has seven and one-half whorls and measures—length, 6.2 mm.; diameter, 3 mm.

SYNCERA MAGDALENENSIS, new species.

Plate 12, fig. 5.

Shell very small, elongate ovate, chestnut brown. Nuclear whorls not differentiated from the postnuclear turns, well rounded. Postnuclear whorls strongly rounded, very narrowly shouldered at the summit, marked by decidedly retractively curved axial lines of growth and apparently without spiral markings. Suture strongly marked. Periphery of the last whorl somewhat inflated, well rounded. Base short, well rounded, with a very narrow umbilical chink. Aperture very broadly oval; posterior angle obtuse; outer lip thin; inner lip strongly curved, passing into the strong parietal callus, which renders the peritreme complete. Operculum typical.

The type, Cat. No. 218323, U.S.N.M., comes from Magdalena Bay. It has 5.1 whorls and measures—altitude, 2.2 mm.; diameter, 1.4 mm. Two additional lots have been examined, as follows: Cat. No. 218325, U.S.N.M. seven specimens, from Magdalena Bay, Lower California, and Cat. No. 218324, U.S.N.M., four specimens from the same locality.

SYNCERA TRANSLUCENS (Carpenter).

Plate 12, fig. 7.

1864. *Jeffreysia translucens* CARPENTER, Rept. Brit. Ass. Adv. Sci., 1863, pp. 613, 657.

1865. *Hydrobia californica* TRYON, Amer. Journ. Conch., vol. 1, p. 221, pl. 22, fig. 11.

1866. *Jeffreysia translucens* CARPENTER, Proc. California Acad. Sci., vol. 3, p. 219.

Shell broadly ovate, light brown. Nuclear whorls not differentiated from the remaining turns, well rounded. Postnuclear whorls strongly rounded, very narrowly shouldered at the summit, marked by decidedly retractively curved axial lines of growth, and exceedingly fine microscopic spiral striations. Suture strongly impressed. Periphery of the last whorl well rounded. Base inflated, well rounded. Aperture subcircular; posterior angle obtuse; outer lip thin; inner lip very strongly curved, thick, reflected over and appressed to the base; parietal wall covered with a thick callus which fuses with the reflected inner lip and forms a decided callosity over the umbilical region. Operculum typical.

The specimen described and figured, Cat. No. 271483, U.S.N.M., is one of a large series collected at San Diego, California. It has five and one-half whorls and measures—altitude, 3 mm.; diameter, 1.9 mm.

The following additional specimens have been examined:

Cat. No.	Collection of—	Number of specimens.	Locality.	Remarks.
126645	U.S.N.M.	21	Vancouver Island, British America.	
150953	do	4	do	
152188	do	10	Whidby Island, Puget Sound	
56442	do	1	Eureka, California	
56398	do	15	Oakland, California	
23727	do	5	do	
32380	do	2	do	
32381	do	6	do	
32382	do	2	do	
152191	do	1	San Pedro, California	
185364	do	2	do	
56453	do	15	San Diego, California	
105431	do	4	do	Mossy rocks, near low tide.
198579	do	15	do	
99294	do	3	do	
152313	do	6	do	Ocean beach.
32372	do	87	do	
195336	do	25	do	
271493	do	13	do	
273714	do	4	do	Drift.
[1]271483	do	427	do	
130319	do	2	San Diego Bay, California	Do.
191580	do	1	Terminal Island, California	
199181	do	2	Alamitos Bay, California	
32378	do	26	Catalina Island, California	
148264	do	8	California	
32367	do	2	do	
56442	do	10	do	
271508	do	27	Santo Domingo, Lower California.	
32369	do	16	Todos Santos Bay, Lower California.	
198963	do	4	do	
198961	do	1	do	
105542	do	8	Manuel Lagoon, Lower California.	Among grass, near high tide.
269166	do	8	Santa Maria Bay, Lower California.	Boat dredge.

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[1] Type.

SYNCERA COMPACTA (Carpenter).

Plate 12, fig. 4.

1864. ? *Hydrobia compacta*, CARPENTER, Rept. Brit. Ass. Adv. Sci., 1863, p. 618.

1864. ? *Hydrobia compacta*, CARPENTER, Ann. Mag. Nat. Hist., ser. 3. vol. 13, p. 478.

Shell very minute, globular (probably chestnut brown). Nuclear whorls not differentiated from the remaining turns. Postnuclear whorls feebly shouldered at the summit, inflated, and strongly rounded, marked by decidedly retractively slanting axial lines of growth. Suture strongly impressed. Periphery of the last whorl inflated, well rounded. Base short, strongly rounded. Aperture large, subcircular; outer lip thin; inner lip strongly curved, passing into the strong parietal callus, which is reflected over the base.

The type, Cat. No. 16209, U.S.N.M., was collected at Cape St. Lucas, Lower California. It has four whorls and measures—altitude, 1 mm.; diameter, 0.75 mm. Doctor Carpenter's type, the only specimen at hand, is a dead, worn shell, which I strongly suspect of being a young specimen. It is undoubtedly closely related to *Syncera translucens*.

Genus BARLEEIA Clark.

The genus *Barleeia* was described by William Clark in 1855[1], who gives an interesting account of the animal of *Barleeia rubra* Montagu, the hologenotype of the proposed genus, which, considering the scarcity of anatomic data, bears repeating here:

> *Shell.*—The color is plain red-brown, smooth or slightly wrinkled, of 4½ to 5½ tumid volutions, which form a rapidly increasing cone. Aperture oval, entire, contracted above, rounded basally; outer margin sharp, without the callous pad of the *Rissoa*. Axis one-tenth, diameter one-seventeenth of an inch.
>
> *Animal.*—The mantle is plain, even with the margin of the shell, and without the filament seen at the upper angle of the aperture in many of the *Rissoa*. Rostrum very short, not corrugated nor capable of much extension, brindled above with dark smoke-colored, fine, irregular, close-set lines, below pale yellow; buccal disk of the same color, of small area, crosially and vertically cloven, containing the usual masticatory processes of the Littorinidae; neck dark, but not so much so as the rostrum, quite plain and without appendages. Tentacula very short, strong, broad, not in the least setaceous, with perfectly rounded, somewhat spatulate extremities; they are not vibrated on the march; color very pale yellowish-white, with a line of sulphur-colored beads or minute flakes running centrally from base to point; eyes very large, black, fixed on bright sulphur inflations at the external bases. Foot an elongated, rather narrow oval, anteally arcuated, labiated, with scarcely perceptible auricular points, posteally rounded, emarginate in the centre of its termination; color, in the middle of the upper part, confused flake-white, margined with a belt of pale smoke hue; sole pale yellow with a decided depressed longitudinal line on the center of the posterior half, not constricted under the slight auricules

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[1] British Marine Testaceous Mollusca, pp. 392–395.

> as in *Rissoa*, and not so slender. The operculigerous lobe is small, very little alated anteriorly, but expands below into a dark, flat, arcuated membrance; no cirrhus is visible, and I believe none exists; it carries a strong, red-brown, suboval, testaceous operculum, sharp above, rounded below and at the outer edge, and straighter on the columellar side. The structure of the fine stria on the upper surface is of subannular figure, with a longitudinal furrow about the middle, which forms a raised rib on the under part, the whole of that area being thick, coarse, and irregular, with, at the nucleus (which is nearer the base than the center) a testaceous apophysis, more prominent than in *Jeffreysia* and stronger and longer; indeed, as much as in some of the *Chemnitzia*.
>
> These animals inhabit the lower littoral levels at Penzance; their locomotion is deliberate, and they evince considerable shyness. There are many fasciated varieties and a white one.

An examination under high magnification of the genotype and the West American material permits me to add that the nepionic whorls are finely thimble pitted.

Only four species and a variety, the latter without real status, have prior to this been reported from the West Coast of America. The first two of these were described by Philip P. Carpenter in 1856, on pages 361 and 362 of the Catalogue of Mazatlan Shells, under the names of *Hydrobia ulva ?* Pennant and *Jeffreysia alderi*, while the rest: *Barleeia subtenuis*, *Barleeia* (*? subtenuis*, var.) *rimata* and *Barleeia haliotiphila*, were christened by the same author in 1864 in the 1863 Report of the British Association for the Advancement of Science, the first name replacing *Hydrobia ulva ?* of the Mazatlan Catalogue. In 1870 de Folin added a fourth species, *Rissoa polychroma*, in volume 1 of his Fonds de la Mer (p. 133, pl. 20, fig. 5).

The large amount of material that has accumulated in the collection of the United States National Museum not only enables one to more clearly define the range of distribution of the known forms, but also makes it necessary to describe a number of additional species.

KEY TO THE WEST AMERICAN BARLEEIAS.

Periphery of the last whorl acutely carinated:
  Altitude about 4 mm.------------------------------ *dalli.*
  Altitude about 2 mm------------------------------ *bentleyi.*
Periphery of the last whorl not acutely carinated:
  Periphery of the last whorl obsoletely carinated:
    Shell unicolor:
      Shell broadly conic
        Whorls coarsely spirally striate------------------ *subtenuis.*
        Whorls finely spirally striate------------------ *sanjuanensis.*
      Shell narrowly conic:
        Altitude about 3.2 mm------------------------------ *oldroydi.*
        Altitude about 2.5 mm------------------------------ *haliotiphila.*
    Shell banded:
      Whorls strongly inflated------------------------------ *polychroma.*
      Whorls not strongly inflated------------------------------ *californica.*

- Periphery of the last whorl not acutely carinated—Continued.
  - Periphery of the last whorl not obsoletely carinated:
    - Periphery of the last whorl rounded:
      - Shell umbilicated -- *orcutti.*
      - Shell not umbilicated:
        - Shell unicolor:
          - Shell chestnut brown-------------------------- *subtenuis.*
            - Whorls strongly inflated-------------- *coronadoensis.*
            - Whorls not shrongly inflated------------- *carpenteri.*
        - Shell banded --- *alderi.*

BARLEEIA DALLI, new species.

Plate 13, fig. 10.

Shell rather large, broadly conic, yellowish white. Nuclear whorls two, well rounded, marked by sinuous axial rows of closely spaced pits, which are separated by spaces about four times as wide as the pits. Postnuclear whorls almost appressed at the summit, moderately rounded, marked by slender, slightly retractively slanting incremental lines and numerous closely spaced spiral striations. Suture but slightly constricted. Periphery of the last whorl marked by a cord, which renders it decidedly angulated. Base moderately long and moderately rounded, marked like the spire. Aperture subcircular, posterior angle obtuse; outer lip thin at the edge; inner lip slender, evenly curved, appressed to the base, except at the extreme anterior portion, where it is free; parietal wall covered by a thick callus, which joins the columella with the outer lip at the posterior angle and renders the peritreme complete. The summit of the last turn bends slightly down below the peripheral cord near the aperture.

The type and 49 additional specimens, Cat. No. 209013, U.S.N.M., were dredged at the Bureau of Fisheries Station 4310 in 71 to 75 fathoms on sand and mud bottom, off Point Loma, California. The type has six and one-quarter whorls and measures—altitude, 4.4 mm.; diameter, 2.4 mm.

BARLEEIA BENTLEYI, new species.

Plate 13, fig. 2.

Shell small, conic, flesh colored, excepting the two nuclear turns, which are light brown. Nuclear whorls well rounded, marked by curved axial rows of closely spaced pits, which are separated by spaces about one and a half times the diameter of the pits. Postnuclear whorls moderately well rounded. The appressed summit of these whorls falls slightly below the peripheral keel, and allows this to appear in the suture as a slender thread. The surface of the postnuclear turns is marked by curved incremental lines and numerous fine, rather closely spaced, spiral striations. A strong cord marks the periphery and renders it decidedly angulated. Base moderately long, well rounded, marked like the spire. Aperture large, posterior angle obtuse, slightly effuse at the junction of the inner and basal lip; outer lip thin; inner lip slender, oblique, and appressed for the greater part, to the base, the anterior portion only being free; parietal wall covered by a thick callus, which renders the peritreme complete; operculum typical.

The type, Cat. No. 332121, U.S.N.M., and 350 additional specimens, were collected on Bryozoa at the breakwater at Venice, California. The type has five and one-third whorls and measures—altitude, 2.2 mm.; diameter, 1.2 mm.

BARLEEIA SUBTENUIS Carpenter.

Plate 13, fig. 11.

1856. *Hydrobia ulvae* CARPENTER, Cat. Maz. Shells, p. 361.

1864. *Barleeia subtenuis* CARPENTER, Rept. Brit. Ass. Adv. Sci., 1863, pp. 546, 623, 656, 669.

1864. *Barleeia subtenuis* ? var. *rimata* CARPENTER, Rept. Brit. Ass. Adv. Sci., 1863, p. 656.

1865. *Barleeia subtenuis* CARPENTER, Journ. de Conchyl., vol. 12, pp. 143–144.

1865. *Barlieeia* (*? subtenuis*, var.) *rimata* CARPENTER, Journ. de Conchyl., vol. 12, p. 144.

1865. *Rissoa cooperi* TRYON, Amer. Journ. Conch., vol. 1, p. 222, pl. 22, fig. 13.

Shell oval, pale brown. Nuclear turns two, well rounded, marked by numerous fine pits, which are arranged in axial and spiral series. Postnuclear whorls well rounded, almost appressed at the summit, marked by slender, retractively slanting incremental lines, and numerous fine, closely spaced spiral striations. Suture moderately constricted. Periphery of the last whorl usually obsoletely angulated but at times rounded. Base short, well rounded, usually with a narrow umbilical chink at the columella. Aperture large, rather flaring; posterior angle acute; outer lip thin; inner lip rather strongly curved forming an acute angle at its junction with the basal lip, appressed to the body whorl for about half its length, the anterior half being free; parietal wall covered by a thick callus which renders the peritreme complete; operculum typical.

The specimen figured is one of 147 bearing the catalogue number 56446, U.S.N.M., and comes from San Diego, California. It is a typical specimen, having five and one-half whorls and measures—altitude, 3 mm.; diameter, 2.7 mm.

The following additional specimens are in the collection of the United States National Museum:

Cat. No.	Collection of—	Number of specimens.	Locality.	Remarks.
564	U.S.N.M.	2	San Pedro, California	
23739	do	3	do	
[1]56446	do	147	do	
32375	do	878	do	
198588	do	130	do	
56447	do	78	do	
32366	do	4	do	
273710	do	362	San Diego, California	Drift.
271487	do	5	do	
252946	do	2	do	
332007	do	1	do	
274045	do	51	do	Dredged foot of Broadway.
274031	do	1	do	Do.
252943	do	4	do	
32358	do	378	do	
159329	do	281	do	
23734	do	2	do	
32359	do	3	do	
334448	do	17	San Diego Bay, California	1½ fathoms.
211129	do	118	do	3 fathoms, 58.°
308792	do	1	do	Drift.
207239	do	2	do	7 fathoms, sand and mud bottom.
32363	do	3	California	
32364	do	3	do	
32365	do	3	do	
206632	do	4	Southern California	
105541	do	10	Manuel Lagoon, Lower California.	
105561	do	8	San Ignacio Lagoon, Lower California.	On stones; mud flats between tides.
105562	do	7	do	Shell washings.
198968	do	3	Todos Santos Bay, Lower California.	

[1] One type.

BARLEEIA SANJUANENSIS, new species.

Plate 13, fig. 3.

Shell broadly conic, chestnut brown, except the nuclear whorls, which are pale brown. Nuclear turns two, well rounded, marked by numerous rather strong pits, which are arranged in axial and spiral series. Postnuclear whorls very slightly shouldered at the summit, well rounded, marked by numerous, rather coarse incised spiral lines. Periphery obscurely angulated. Suture well marked. Base well rounded, marked like the spire. The summit of the last turn bends decidedly downward behind the aperture. Aperture subcircular; posterior angle decidedly obtuse; outer lip rather thick; inner lip strongly curved, appressed to the base; parietal wall covered by a thick callus, which renders the peritreme complete.

The type and another specimen, Cat. No. 334488, U.S.N.M., were collected by Dr. C. C. Engberg in the Gulf of Georgia. The type has five and one-half whorls and measures—altitude, 2.6 mm.; diameter, 1.5 mm.

The present species, while ranging nearest to *Barleeia subtenuis* Carpenter in our key, is readily distinguished from that form by its much larger nuclear whorls and the stronger pittings thereof, resembling in these characters *Barleeia dalli* and *Barleeia bentleyi*. It is much more strongly spirally sculptured than *Barleeia subtenuis* and has the aperture much smaller. Three additional specimens from the same lot are in Doctor Engberg's collection.

BARLEEIA OLDROYDI, new species.

Plate 13, fig. 9.

Shell narrowly conic, light chestnut brown. Nuclear whorls one and three-fourths, well rounded, marked by slightly retractively slanting rows of exceedingly minute pits, which appear to be arranged also in spiral series. Postnuclear whorls almost flat, appressed at the summit, marked by fine incremental lines and exceedingly fine, closely spaced spiral striations. Suture only slightly constricted. Periphery of the last whorl obsoletely angulated. Base moderately long, moderately well rounded. Aperture moderately large, oval; posterior angle obtuse; outer lip thin; the curved inner lip joins the basal lip in a curve; inner lip appressed to the base for a little more than half its length, the extreme anterior portion only being free; parietal wall covered by a thick callus, which renders the peritreme complete. The summit of the last turn falls slightly below the peripheral angle at the aperture; operculum typical.

The type, Cat. 32376, U.S.N.M., comes from Monterey Bay, California. It has 6.1 whorls and measures — altitude, 3.3 mm.; diameter, 1.5 mm.

The following additional specimens have been examined:

Cat. No.	Collection of—	Number of specimens.	Locality.	Remarks.
211608	U.S.N.M..	2	Barkley Sound, Vancouver Island.	
126651	...do.....	4	Mink Bay, Vancouver Island.	
334449	...do.....	1	Trinidad, California.........	
271413	...do.....	6	Little River, Mendocino County, California.	
[1] 32376	...do.....	12	Monterey, California........	
32362	...do.....	3	.....do.....................	

[1] One type.

Cat. No.	Collection of—	Number of specimens.	Locality.	Remarks.
74002	U.S.N.M..	2	Monterey, California........	
199170	...do.....	4	.....do.....................	
334450	...do.....	1	.....do.....................	
56448	...do.....	74	.....do.....................	
56355	...do.....	11	.....do.....................	
56370	...do.....	15	San Diego, California........	
32360	...do.....	29	.....do.....................	
194398	...do.....	4	.....do.....................	
99292	...do.....	15	.....do.....................	
130242	...do.....	9	.....do.....................	On grass between tides.
274025	...do.....	1	.....do.....................	Dredged foot of Broadway.
211938	...do.....	1	Off San Diego, California....	20 fathoms, 58°, sand.
334451	...do.....	4	Los Coronados Islands, off N.W. Lower California.	20 fathoms, 58°, gray sand, broken shells.

BARLEEIA HALIOTIPHILA Carpenter.

Plate 13, fig. 1.

1864. *Barleeia haliotiphila* Carpenter, Rept. Brit. Ass. Adv. Sci., 1863, p. 656.

1865. *Barleeia haliotiphila* Carpenter, Journ. de Conchyl., vol. 12, pp. 144–145.

Shell elongate conic, pale chestnut brown. Nuclear whorls almost two, well rounded, marked by curved, axial rows of pits which are also arranged in spiral series. Postnuclear whorls moderately well rounded, almost flat at the summit, marked by fine incremental lines and exceedingly fine closely spaced spiral striations. Suture moderately constricted. Periphery of the last whorl obscurely angulated. Base moderately long and moderately rounded, marked like the spire. Aperture rather small, oval; posterior angle obtuse; outer lip thin; the basal and inner lip meet in a well-rounded curve; inner lip appressed to the base, except at the anterior third, which is free; parietal wall covered by a thick callus which renders the peritreme complete; operculum typical.

The type, Cat. No. 15558, U.S.N.M., was collected on the back of a Haliotis by Rowell in Lower California. It has almost six whorls and measures: altitude, 2.5 mm.; diameter, 1.3 mm. This species closely resembles *Barleeia oldroydi.* It is, however, uniformly smaller, with a decidedly smaller aperture.

The following additional specimens have been examined:

Cat. No.	Collection of—	Number of specimens.	Locality.	Remarks.
271414	U.S.N.M..	2	Little River, Mendocino County, California.	
173804	...do.....	1	La Jolla, California..........	
32371	...do.....	34	San Miguel Island, California.	
32373	...do.....	8	.....do....................	
171914	...do.....	4	Catalina Island, California...	Between tides.
195135	...do.....	4	.....do....................	
334452	...do.....	41	.....do....................	
210497	...do.....	11	.....do....................	
[1] 15558	...do.....	1	Lower California...........	
32370	...do.....	9	Todos Santos Bay, Lower California.	
105471	...do.....	4	Point Abreojos, Lower California.	

[1] Type.

BARLEEIA POLYCHROMA (de Folin).

Plate 13, fig. 6.

1870. *Rissoa polychroma* DE FOLIN, Fonds de la Mer, vol. 1, pp. 133–134, pl. 20, fig. 5.

Shell small, ovate, varying in color from violaceous through reddish, brownish, to horn white, ornamented with indistinct color bands, which at times are almost lost in the ground color. Nepionic whorls two, decidedly depressed, marked by pits which are arranged in axial and spiral series. Postnuclear turns three, inflated, marked by oblique lines of growth and fine spiral striations. Suture simple. Periphery obscurely angulated. Base short, inflated, well rounded. Aperture subcircular; outer lip thin; inner lip separated from the body whorl.

The type has five whorls and measures—altitude, 1.7 mm.; diameter, 1.1 mm. De Folin states that he had 20 specimens from the Bay of Panama. We have not seen this species.

BARLEEIA CALIFORNICA, new species.

Plate 13, fig. 7.

Shell very small, broadly conic, pale brown, sometimes with a lighter zone at the periphery and a darker band on the middle of the base. Nuclear whorls one and three-fourths, well rounded, marked by numerous, rather large, rounded pits, which are arranged in retractively slanting axial as well as a spiral series, the spaces between the pits being about equal to the diameter of the pits. Postnuclear whorls moderately well rounded, almost appressed at the summit, marked by somewhat retractively slanting incremental lines, and very fine incised spiral striations. Suture moderately impressed. Periphery of the last whorl obsoletely angulated. Base very short, well rounded. Aperture very large, oval; outer lip rather effused at the junction of the outer and basal lip, and forming almost an angle at the junction of the basal and inner lip; inner lip slightly curved, appressed to the base for three-fourths of its length, the anterior portion only being free; parietal wall covered by a thick callus, which renders the peritreme complete.

The type, Cat. No. 152192, U.S.N.M., was collected at Crocker's wharf, San Pedro, California. It has five whorls and measures—altitude, 1.8 mm.; diameter, 1.1 mm. The small size and the color banding, as well as the very large aperture, will distinguish this from the other obscurely angulated *Barleeias* of the West Coast.

The following additional specimens have been examined:

Cat. No.	Collection of—	Number of specimens.	Locality.	Remarks.
173090	U.S.N.M..	1	Terminal Island, California. .	
[1] 152192	...do.....	41	Crocker's wharf, San Pedro, California.	
3566*b*.	...do.....	1	San Diego, California.........	
189145	...do.....	4	Catalina Island, California. . .	Deep water.
171914*a*	...do.....	6	.....do......................	Between tides.
334453	...do.....	5	.....do......................	
105588	...do.....	5	Point Abreojos, Lower California.	

[1] Type.

BARLEEIA ORCUTTI, new species.

Plate 13, fig. 8.

Shell very small, elongate oval; the early whorls white, the last with the posterior half diffused with pale brown, the anterior white, and a broad light brown band on the middle of the base. Nuclear whorls almost two, well rounded, marked by numerous small pits which are arranged in more or less sinuous axial lines, as well as in spiral series. Postnuclear whorls rather inflated, well rounded, very narrowly shouldered at the summit, marked by fine retractively slanting incremental lines and exceedingly fine spiral striations. Suture well marked. Periphery of the last whorl well rounded. Base short, well rounded, marked like the spire. Aperture subcircular; posterior angle obtuse; outer lip thin; the basal and inner lip join in an even curve; inner lip free, curved, continuing posteriorly into a parietal callus, which is also partly free from the body wall and joined to the posterior angle of the aperture, rendering the peritreme complete. The summit of the last whorl sinks slightly below the periphery at the aperture; operculum typical.

The type, and five additional specimens, of this species, Cat. No. 218360, U.S.N.M., were collected by Mr. Orcutt in Magdalena Bay, Lower California. The type has five and one-half whorls and measures—altitude, 2.2 mm.; diameter, 1.3 mm. Two additional specimens, Cat. No. 105482, U.S.N.M., come from Point Abreojos, Lower California.

BARLEEIA CORONADOENSIS, new species.

Plate 13, fig. 5.

Shell ovate, white. Nuclear whorls two and a fifth, well rounded, marked by numerous pits, which are arranged in curved axial lines as well as in spiral series. Postnuclear whorls strongly rounded, appressed at the summit, marked by feeble incremental lines and exceedingly fine spiral striations. Suture rather constricted. Periphery of the last whorl strongly rounded. Base moderately long and well rounded. Aperture large, broadly ovate, rather effuse at the junction of the base and outer lip; posterior angle obtuse; junction of the inner and basal lip well rounded; outer lip thin; inner lip well rounded, reflected over and appressed to the base except at the extreme anterior portion where it is free; parietal wall covered by a thick callus, which renders the peritreme complete; operculum typical.

The type and six additional specimens, Cat. No. 226453, U.S.N.M., were collected in 7–10 fathoms off Coronados Islands, northwest coast of Lower California. The type has four and one-fifth whorls and measures—altitude, 1.3 mm.; diameter, 9 mm.

BARLEEIA CARPENTERI, new species.

Plate 13, fig. 4.

Shell elongate ovate, white. Nuclear whorls two, well rounded, marked by numerous pits, which are arranged in axial and spiral series. Posterior whorls narrowly, tabulately shouldered at the summit, more so on the early whorls than on the last, well rounded, marked by slender, curved incremental lines and fine spiral striations. Suture well marked. Periphery of the last whorl strongly rounded. Base moderately long, well rounded. Aperture ovate; posterior angle obtuse; outer lip thin at the edge; inner lip strongly curved, appressed to the base, free only at the anterior fourth; parietal wall covered by a thick callus, which renders the peritreme complete; the summit of the last whorl falls slightly below the periphery at the aperture.

The type, Cat. No. 16215, U.S.N.M., comes from St. Lucas, Lower California. It has 4.8 whorls and measures—altitude, 1.6 mm.; diameter, 1.1 mm.

BARLEEIA ALDERI (Carpenter).

Plate 12, fig. 6.

1856. *Jeffreysia alderi* Carpenter, Cat. Maz. Shells, p. 362.

1857. *Jeffreysia alderi* Carpenter, Rept. Brit. Ass. Adv. Sci., 1856, pp. 257, 327.

1864. *Jeffreysia alderi* Carpenter, Rept. Brit. Ass. Adv. Sci., 1863, pp. 109, 143.

Shell small, elongate ovate, wax yellow, with a pale narrow brown band about one-sixth of the distance between the summit and the suture anterior to the summit, and a second one of about the same width an equal distance posterior to the suture; a third brown band, a little wider than these encircles the base almost at its middle. Nuclear whorls two, well rounded, marked by minute pits, which are arranged in axial and spiral series. Postnuclear whorls only moderately rounded, almost appressed at the summit, marked by slender incremental lines and fine incised spiral striations. Suture feebly impressed. Periphery of the last whorl strongly rounded. Base moderately long, well rounded. Aperture almost subcircular; outer lip thin at the edge, decidedly curved; inner lip strongly curved, appressed to the base for its greater length, the extreme anterior portion only being free; parietal wall covered by a moderately thick callus, which renders the peritreme complete; the summit of the last whorl falls considerably below the periphery at the aperture.

The specimen described and figured is Cat. No. 15423, U.S.N.M., and comes from Guacomayo, Mexico. It has 5.1 whorls and measures—altitude, 2.1 mm.; diameter, 1.2 mm.

Cat. No. 264996, U.S.N.M.; 2 from Agua Verde Bay, Gulf of California.

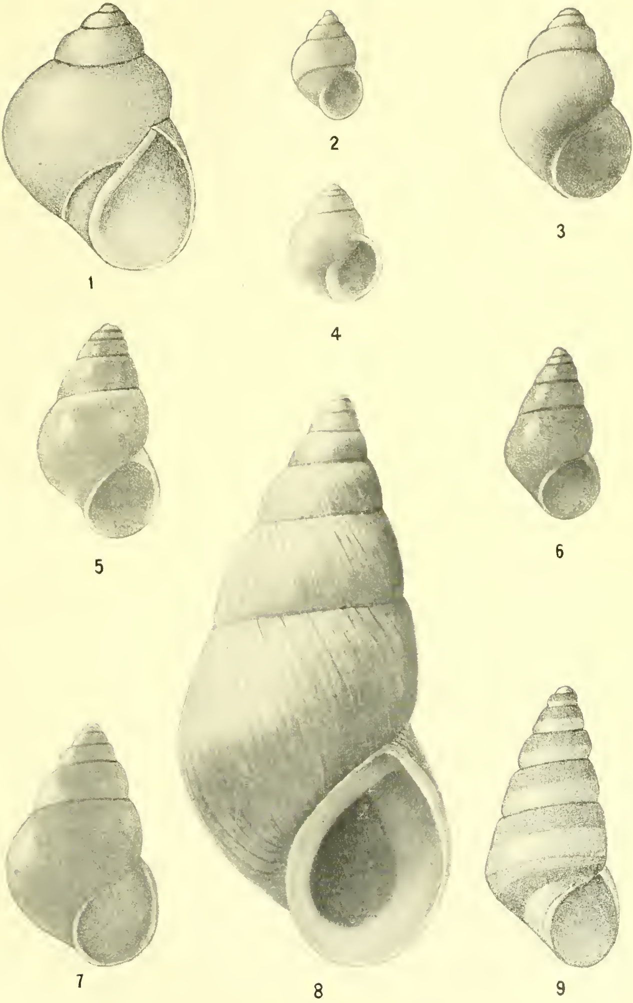
EXPLANATION OF PLATES.

PLATE 12.

Fig. 1. *Rissoella tumens* (Carpenter), type.
2. *Rissoella bifasciata* (Carpenter), type.
3. *Rissoella excolpa*, new species, type.
4. *Syncera compacta* (Carpenter), type.
5. *Syncera magdalenensis*, new species, type.
6. *Barleeia alderi* (Carpenter), type.
7. *Syncera translucens* (Carpenter), type.
8. *Syncera panamensis*, new species, type.
9. *Rissoella anguliferens* (deFolin), type.

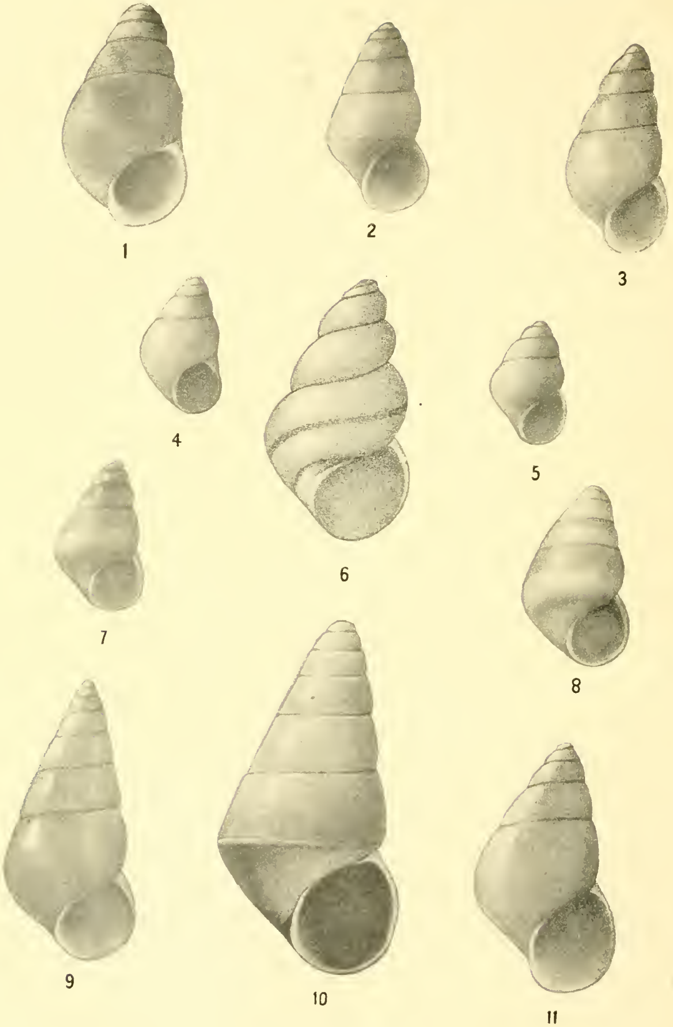
PLATE 13.

Fig. 1. *Barleeia haliotiphila* Carpenter, type.
2. *Barleeia bentleyi*, new species, type.
3. *Barleeia sanjuanensis*, new species, type.
4. *Barleeia carpenteri*, new species, type.
5. *Barleeia coronadoensis*, new species, type.
6. *Barleeia polychroma* (deFolin), type.
7. *Barleeia californica*, new species, type.
8. *Barleeia orcutti*, new species, type.
9. *Barleeia oldroydi*, new species, type.
10. *Barleeia dalli*, new species, type.
11. *Barleeia subtenuis* Carpenter, type.



WEST AMERICAN MOLLUSKS.

FOR EXPLANATION OF PLATE SEE PAGE 176.



West American Mollusks.

For explanation of plate see page 176.

NEW SERPHIDOID CYNIPOID, AND CHALCIDOID HYMENOPTERA.

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The following descriptions and notes are based upon material in the collections of the U. S. National Museum. North America forms make up most of the matter.

SERPHIDOIDEA.

POLYMECUS SEMIGLABER, new species.

Female.—Length, 1.05 mm.

Differs from *compressiventris* Ashmead in not having the distinct deep parapsidal furrows nor the distinct scaly sculpture on the mesonotum nor the convex rounded caudal margin of the abdominal segments and in being very much smaller and so on. From *insularis* Ashmead in having the upper occiput finely cross-lined instead of densely reticulato-punctate, the parapsidal furrows obsolete or nearly and as indicated, farther apart distad (separated by the width of the base of the scutellum but very indistinct, obsolete or nearly), the scutellum is much less armed at apex and so on. From *canadensis* Ashmead, in being very much smaller, in lacking the deep parapsidal furrows and distinct scaliness of the scutum, segment 3 of the abdomen is not striated so distinctly at base and so on. Cephalic aspect of head very delicately scaly, also cephalic scutum. Base of scape, segment 2 of abdomen (counting the first body segment as such) often and the legs reddish yellow. Club 5-jointed, all the joints subequal or a little longer than wide except the last which is the longest flagellar joint except the pedicel. Funicle 2 distinctly shorter than the pedicel but a little longer than wide, 1 and 3 shorter than 2. Segment 3 of abdomen reaching nearly to the middle, much the longest, 4, 5, and 6 subequal, each somewhat wider than long, 7 conical and somewhat longer than wide. Ovipositor extruded for a length equal to over half that of the abdomen. Scutellum glabrous. Propodeum with a strong carina on each side of the meson. Segment 2 of the abdomen with about six striae along its meson, 3 finely striate at basal third on each side of the meson but not densely so. Lateral ocelli far from the eyes, somewhat nearer the middle ocellus. Abdomen glabrous except as noted. Mandibles acutely bidentate. Scutellum with carinated lateral margins and a tubercle at apex.

The male is similar but the abdomen is more ovate, segment 4 and 5 more transverse, the antennae are filiform, the club 1-jointed and a little longer than the pedicel, the distal five funicle joints are moniliform, the first very small and cupshaped, 2 is large and crescentic, longer than the club. In the male, the first three antennal joints are yellow. The species *americanus* is nearly entirely black (three of its types, the fourth type a different species); moreover its scutellum is densely scaly, its parapsidal furrows very distinct and complete and so on.

From several pairs reared from the galls of *Rhopalomyia hirtipes* in New York State (Albany, E. P. Felt).

Types.—Cat. No. 20610, U.S.N.M. two males, three females on a tag, and a slide bearing a male head and four females.

TRICHOPRIA POPENOEI Ashmead ILLINOISENSIS, new variety.

Female.—Very similar to *popenoei popenoei* Ashmead but the basal third of the club, the pedicel and the funicle joints are usually reddish while club 1 is distinctly larger than the last funicle joint, nearly as large as 2 (in the other, club 1 is but a little larger than the last funicle joint and about half the size of 2). Otherwise the same. Scutellum with carinated lateral margins "parapsidal furrows" present, thorax caudad of scutellum tricarinate at the meson in both forms. Types compared. The "parapsidal furrows" are far laterad (not the real furrows but the suture separating pleurum and notum). From three females, Urbana, Illinois.

In the supposed male, it is similar to the male of the typical form except that funicle 1 is somewhat shorter. The legs may be less black than usual.

Types.—Cat. No. 20842, U.S.N.M. two females on tags.

TELENOMUS POETA, new species.

Female.—Of the same stature and so forth as *hakonensis* Ashmead but the antennae and legs are entirely black, the entire head except the cheeks is scaly except at the clypeus (the entire mesal face glabrous in the other), funicle 1 is no longer than the elongate pedicel (distinctly longer in the other) and so on. Also segment 3 of the abdomen extends nearer to the apex in the other species, the striae on segment 2 extend the entire length (only half way here) while the postscutellum is rugoso-punctate but here finely long-striate. Scutellum glabrous in both as is also the base of segment 3 of the abdomen along extreme base in this new species, along proximal fourth in *hakonensis*. Scutum finely rugose-scaly and pubescent in both. Differs markedly from the Indian *colemani* in that the latter has segment 3 of the abdomen a little wider than long and striate along meson for over half its length, the scutellum is finely scaly in that species and the fore wings narrow (here broad). Tarsi reddish-yellow also each end of the tibiae narrowly; segments 4–7 with numerous very minute punctures. Scutum with a granulate appearance. Funicle 3 oval, 4 globular; club 5-jointed, 2 largest, 3 and 4 subequal, each a little shorter than 2 and subquadrate. Eyes hairy.

Three females from the eggs of *Caligula japonica*, Central Japan, (J. H. Watson and A. D. Imms).

Types.—Cat. No. 20604, U.S.N.M., the females on a tag.

ANTERIS VIRGINIENSIS Ashmead.

The females agree in sculpture with the male type; funicle 4 is smallest; the base of segment 3 of the abdomen is also yellowish; (in the male nearly the whole of 3) rest of abdomen (except 2 and 3) finely scaly. In the male, the collar is but obscurely yellow; segment 4 of the abdomen longest, subglabrous, 3 striated along its basal two thirds.

CERAPHRON CARLYLEI, new species.

Female.—Very similar indeed to *basalis* Ashmead but differing in having only the scape (except rather broadly at apex) brownish-yellow, the abdomen is a half less broadly yellow at base above (nearly proximal half in *basalis*) the thorax is scaly reticulate not glabrous, the striae at base of the long segment 2 of the abdomen are longer. Closer to *pallidiventris* Ashmead but at once distinguished from that species in bearing just distad of the apex of the scutellum a short, curved horn while in the other species there is at this place only a mucronate spot; moreover the antennae are more slender, the size a third smaller, the striae at base of abdomen somewhat longer, funicles 2-4 subquadrate, 5 not plainly wider than long but subquadrate, three-fourths the length of 6 (the club appearing 4-jointed, in the other 3-jointed), not half the length in the other. Otherwise as in *basalis*. Both species bear a sulcus between the lateral ocelli on the vertex.

Compared with the types of *basalis* and the evident type of *pallidiventris* (labeled as that species but without "type," in Ashmead's handwriting and "Fort Pendleton, West Virginia, July 7").

Type.—Cat. No. 20843, U.S.N.M., the female on a tag, a pair of wings and an antenna on a slide.

Described from one female, Urbana, Illinois.

MACROTELEIA RUSKINI, new species.

Female.—A half smaller than *floridana* Ashmead and differing from it in a number of characters as follows: At base of abdomen there is a distinct hump (a less noticeable horn than is usual for

Calotelea), segment 2 (except this hump) and base of segment 3, prothorax, sides and venter of thorax, legs, scape (except above at apex) and the pedicel (except above) honey yellow; the parapsidal furrows are represented by less distinct carinae which are along distal half only; abdomen finely long striate to a little distad of the middle of segment 4, thence subglabrous, with numerous scattered, setigerous, pin-punctures, especially dorso-laterad; the thorax is finely scaly, the propodeum a half shorter at the meson; the vertex is densely scabrous, the lower cheeks and middle face glabrous; lower and upper face and cheeks near the suture and caudo-laterad with numerous pin-punctures, the vertex also with these but the dense surface sculpture obscures them; the marginal vein is only twice longer than wide, half the length of the stigmal, the latter slightly shorter than the postmarginal. One mandible with at least three teeth. Funicle 2 is only a little longer than wide, not quite half the length of 1, somewhat longer than 3 and 4. From one female. Illinois.

Type.—Cat. No. 20844, U.S.N.M., the female on a tag, fore wing on a slide. An anomalous species.

MACROTELEIA FLORIDANA Ashmead GOLDSMITHI, new variety.

Female.—A fifth smaller than *floridana floridana* and similar to it but differing as follows: Funicle 3 is over twice longer than wide (only a little longer than wide in the other), the vertex is subglabrous but caudad more and more punctate, with scattered punctures in front of the lateral ocelli (in the other densely scaly the punctures smaller and less dense), the abdomen is strongly uniformly striated, the striae somewhat anastomosing in places, punctures on segments 6–7 (in the other there is a distinct but very delicate median carina on segments 3 and 4 and the striae are finer, but otherwise the same); the propodeum bears four carinae, the inner two paired along the meson, the others, one on each side of the meson (the same in the other). Thorax downy, subglabrous and with numerous scattered pin-punctures (both varieties). Abdomen about twice the length of the thorax and first two pairs of coxae reddish (both forms). Postmarginal vein longer than the marginal. The difference in the length of funicle 3, is the characteristic. Types compared. Club 6-jointed.

From one female received from the Illinois State Laboratory of Natural History. (Accession No. 39995.)

Type.—Cat. No. 20845 U.S.N.M., the female on a tag.

PHANURUS EMERSONI Girault.

The vertex is finely scaly but in front of the anterior ocellus the face is glabrous. Eyes practically naked yet with a few minute hairs. Mandibles tridentate. Segment 2 of the abdomen (the first body segment) is not a fourth the length of 3 which occupies about half of the surface. The ovipositor is often extruded a little. No parapsidal furrows. Club 5-jointed.

PHANURUS TABANIVORUS Ashmead.

The second segment of the body of the abdomen (segment 3) occupies a third of the surface; the abdomen is a half longer than the rest of the body. The eyes are hairy, the vertex scaly, the face in front of the cephalic ocellus, subglabrous.

TRISSOLCUS TRINIDADENSIS Crawford.

Four females from pentatomid eggs, Port of Spain, April 1913, (F. W. Urich). The scutellum bears a median carina. Mr. J. C. Crawford has called my attention to the fact that the median of the three "sulci" on the thorax in this genus is a narrow carina, not a sulcus; this is quite true. The club is 6-jointed in this species.

HADRONOTUS AJAX, new species.

Of the stature of the larger species.

Differs from *insularis* Ashmead in having but the coxae black, the puncturation of segment 3 of the abdomen is much finer, the form less robust, the abdomen less pubescent and the antennal club less stout. From *anasae*, besides the color of the legs, notably in the sculpture of the abdomen, body segment 2 not strongly striate but densely punctate. From *rugiceps* in having the fore femur black, the flagellum black, the marginal vein only a little more than half the length of the stigmal; also the head and thorax are uniformly sculptured. From *carinatifrons* in that the face is cross-striate only in the scrobes. Agrees with the description of the last-named species except as noted and the second body segment of the abdomen has a row of deep punctures along its proximal margin from which short striae proceed; also the coxae are black and the marginal vein not as long as described for the West Indian species. Sometimes the cephalic femur is black and the scape is often dark. Puncturation of the abdomen much finer than that of the thorax. There are two rather large irregular areas just caudad of the anterior ocellus and bounded by a carina. Apex of pedicel and funicle 1–4 may be reddish like the scape. Legs reddish, not honey yellow. The male is similar but the antennae filiform; the flagellum black, moniliform except the club and funicle 1 which are subequal and a third longer than wide, the other joints a little wider than long.

A common species in the United States. There are specimens in the United States National Museum from Kirkwood, Missouri (Murtfeldt), and from Paris, Texas.[1]

Described from a series reared at Baton Rouge, Louisiana, from the eggs of *Anasa tristis* (T. H. Jones), September, 1915.

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[1] Ent. News, 1904, p. 337; and 1913, p. 57.

Types.—Cat. No. 20463, U.S.N.M., three males on a tag and eight females on tags.

CYNIPOIDEA.

PSILODORA CULTRA, new species.

Female.—Length, 3.6 mm., excluding the ovipositor, which is nakedly extruded for the length of the abdomen. Runs to this genus in Kieffer's (1902) table to the Cynipoidea.

Differs from labeled specimens of *Eucoila impatiens* Say mainly in having the extruded ovipositor and hardly otherwise. "Cup" of scutellum melon-seed shaped (like this kind of a seed balanced broad side up upon a short stalk), its distal, obtuse end with a large excavation, two round punctures on its lateral margin at middle; surrounding part of scutellum rugulose. Body glabrous. A line of several punctures distad on each side of scutum; no sutures or furrows on scutum. Head (cephalic aspect) longer than wide, the moniliform 13-jointed antennae inserted near the vertex, above the middle. Legs and first 6 joints of the antennae reddish brown. Funicles distinctly ⅓ longer than wide, the pedicel globular, smallest; other flagellum joints rounded, ovate to ovate, the club about 8-jointed, gradually widening distad, the distal joint as long as funicle 1. Fore wings naked except for exceedingly minute, sparse setae on the disk. Meson of propodeum oval, concaved, the concavity bounded by a stout, obtuse carina along each side.

Described from one female, Urbana, Illinois.

Type.—Cat. No. 20846, U.S.N.M., the female on a tag.

(ALLOTRIA) KLEIDOTOMA AVENAE Fitch.

Two males, three females reared from dipterous larvae, Urbana, Illinois. Compared with male type. The scutellum is long-striate, the cuplike elevation small, oval near apex but connected with base by an attenuation like a median carina; just at its broader end (distad), it bears a round fovea; meson of propodeum glabrous, concaved, the area broad, limited by a ridge down each side. Vertex finely cross-lined. Flagellar joints of the male long-striate, over twice longer than wide.

MICROSTILBA AMERICANA, new species.

Female.—Length, 0.8 mm. Piceous, the wings hyaline, the venation piceous. Antennae subfiliform, the club however, distinct, 5-jointed, the joints oval, joint 5 longest nearly twice longer than wide; funicle 1 twice longer than wide, shorter than the club joints a half the width of the club, 2–5 subequal, each a little longer than wide at apex. Polished, parapsidal furrows carinatiform, diverging nearly to apex, then converging, widely separated laterad. Pedicel subequal to club 1. Petiole short, rugulose; base of abdomen dorsad carinated across (an acute edge) and with very short long-carinae. Propodeum with a pair of stout median carinae, which are a short distance apart and diverge slightly distad; also a lateral ruga, which divides like a Y distad. Cup of scutellum rimmed, reaching to about middle, oval, connected narrowly with base along the meson; scutellum with acute lateral margins and along the distal half more or less long-striate. Two foveae at base of scutellum, one on each side of the narrow pedicel of the cup. Marginal cilia of fore wing moderate.

One female, Urbana, Illinois.

Type.—Cat. No. 20847, U.S.N.M., one female on a tag.

CHALCIDOIDEA.

Family ENCYRTIDAE.

PENTELICUS ALDRICHI Howard.

Genotype.

Head slightly wider than long, the scrobes forming a short triangle whose apex is nearly half way to the anterior ocellus, the cavity scaly; rest of cephalic face above antennae coarsely punctate; frons broad. Scape very slender but with a small foliaceous expansion from before middle to apex. Flagellum subfiliform, the club 3-jointed, obliquely truncate from near base of joint 3, the pedicel longer than any funicle joint. Eyes somewhat longer than the cheeks. Mandibles acutely tridentate, the middle tooth longest. Postmarginal vein nearly as long as the moderately long stigmal, the marginal at costa, punctiform. The type is apparently a female, the ovipositor inclosed to tip by the hypopygium. Scutellum with an obscure median carina. Sculpture of thorax nearly like that of the head but the coarse punctures shallower and the reticulation more plain. Club about half the length of the funicle. From the type in the United States National Museum.

HEMAENASIUS CONFUSUS Ashmead.

Genotype.

Head as in *Pentelicus* but a little more rounded, the punctures are pin-punctures and scattered; the frons not quite so broad (between moderate and broad); the postmarginal vein is somewhat shorter; the scape is dilated from base and somewhat more broadly; the median carina on the large scutellum more distinct. Distal thorax sculptured like the frons. From the type in United States National Museum, but sex unknown, marked "female."

The club is somewhat shorter than that of *Pentelicus.*

HOWARDIELLA PECKHAMI Ashmead.

Genotype.

This species is an *Eucomys.* The cluster of hairs at the apex of the scutellum is present (though rubbed off in the type specimen) as evidenced by the dense area of setigerous dots in the place where the hair clusters ordinarily occur. The mandibles not seen. From the type in the United States National Museum. The head and frons bear numerous, scattered punctures. There is a ridge across the face, from the ventral eye-ends somewhat as in *Taftia*. Later, the mandibles were seen. They are as in *Eucomys* subacute at their extreme ventro-distal apex, the apex broadly convexed (and usually called truncate).

HOWARDIELLA TARSATA Ashmead.

This is not a species of *Eucomys*. The scape and cephalic femur are foliaceously dilated, the cephalic tibiae compressed strongly. The scrobes are long, deep, long-triangular. Frons narrow yet but moderately so. Marginal vein punctiform, not quite at the cephalic wing margin, the postmarginal about twice longer than wide, the stigmal long and somewhat curved. Pedicel elongate, over twice longer than wide, nearly half the length of the funicle, the club pointed conic-ovate, nearly twice the length of the funicle; funicle 1 quadrate, the others nearly twice wider than long. Fore wings with an ovate blotch from the stigmal vein. Mandibles not seen. Scutellum simple. The dilated scape and cephalic femora are characteristic.

From the type in the United States National Museum.

RHOPUS TESTACEUS Ratzeburg.

The submarginal vein terminates in a quadrate marginal, the latter reaching the costal margin and giving off a very short postmarginal; submarginal vein terminating at the caudo-proximal angle of the marginal, far away from the costal margin, since the marginal vein is quadrate. Stigmal vein not long, but about as long as the diameter of the marginal. Corrected description. The venation is very faint. From an European specimen in the United States National Museum.

RHOPOIDEUS FUSCUS Girault.

This is a species of *Rhopus*. The type of *R. fuscus* has been reëxamined; its marginal vein is not so quadrate as in *Rhopus testaceus*. It bears a large thoracic phragma and the ovipositor is inserted near apex.

PARACERAPTROCERUS, new genus.

Like *Ceraptrocerus* Westwood but non-metallic, the free ovipositor is extruded for a third the length of the abdomen, the abrupt, acute end of the frons forms a more prominent, overhanging arch, the mandibles are bidentate, the second tooth broadly truncate, the scutellum somewhat larger. Like *Chrysoplatycerus* Ashmead but that genus is metallic and besides other characters differs notably in having the ovipositor inclosed to apex of the abdomen by the hypopygium. In *Epanusia*, there is no prominent arch on the face. Maxillary palpi 3-jointed. Hind tibial spurs double.

PARACERAPTROCERUS AFRICANUS, new species.

Genotype.

Female.—Length, 1.80 mm., excluding the ovipositor. Robust.

Orange yellow, the following parts purple. Club, a narrow line across the face through the antennae, face of prothorax centrally, venter of thorax at the base of each coxa, scutellum except narrowly at apex, dorsal thorax on each side of same, meson of propodeum, dorsal abdomen except a broad cross-stripe, middle and apex and meson of abdominal venter. Fore wings embrowned except apical end; venation dark. Clypeus hairy. Frons densely finely punctate, the thorax very finely scaly with small punctures scattered over the surface, numerous, each bearing a moderately short black seta. Tarsi white except last joint. Axillae somewhat separated.

One female in the United States National Museum, reared from a *Ceroplastes* on *Elytropappus rhinoceratis*, Cape of Good Hope, Africa (C. P. Lounsbury), October, 1898.

Type.—Cat. No. 20600, U.S.N.M., part of female on a tag, head, fore wing and hind leg on a slide.

APTERENCYRTUS PULCHRICORNIS Ashmead.

Genotype.

Form small, usual; mandibles tridentate the teeth not large, 3 obtuse, shortest. Head (cephalic aspect) rounded, the vertex flat, the frons prominent, moderately narrow, the inflation of the face great; eyes dorsal. Pedicel as long as funicles 5 and 6 combined, the latter largest, each somewhat wider than long, 3 and 4 shortest, twice wider than long, 1 subquadrate, narrower than 6, club 3-jointed, as long as the funicle and two-thirds or more wider. Whole body very finely scaly. Cephalic ocellus advanced. Axillae separated some little distance. The scape is black at base and ventrad, the pedicel above except at apex; funicles 1–4 dusky above. Bulla of scape black. The cephalic tibia has the black cinctus dorsad while the caudal tibia bears a broad cinctus below the knee; the cinctus on the middle tibia is ventrad.

Type examined. Description otherwise correct but the ovipositor is shortly extruded.

The roots of both wings are distinct and it seems as though they may have been torn off close to base. The species may be a *Cheiloneurus*.

HABROLEPOIDEA PERPLEXA, new species.

Female.—Of usual form. Head thin, rounded, inflexed; the antennae inserted at the mouth, the scrobes forming a triangle, the scape slender the flagellum clavate, the club 3-jointed, wider than the funicle, cylindrical, four-fifths the length of the funicle, obtuse at apex; mandibles with three subequal acute teeth. Frons moderate in width, not prominent (face shrunken in death). Eyes longer than the rather long cheeks. Pronotum transverse, the scutellum triangular, obtuse at apex, the axillae joined. Abdomen pointed conic-ovate, longer than the thorax, the ovipositor inserted at base, not extruded. Legs simple, the caudal tibial spurs double. Fore wings abbreviated, extending a short distance distad of the thorax, narrow ovate at apex; the submarginal vein long, forming a longer than wide marginal not far from apex, then a shorter stigmal which is more or less parallel with the apico-distal margin; costal cell wide, especially proximad; submarginal vein concaved and thickened along its apical third; fore wings lightly, variably dusky, with a more or less distinct hairless line from the apex of the venation, the marginal cilia practically absent, the discal ciliation moderately dense, coarser and sparse under the thickened part of the submarginal vein which bears still larger setae. Caudal wing minute, truncate obliquely, its venation extending to the apex.

Length, 0.65 mm.

Dark metallic green suffused with brownish on the mesopleurum, the legs (except the black distal tarsal joint) and the antennae golden yellow. Scutum and scutellum (at least) rather coarsely scaly. Bulla of scape black, the pedicel above and the funicle more or less, dusky. Pedicel nearly twice longer than wide, much longer than any funicle joint; funicles 1–4 subequal, small subquadrate; 5 larger, 6 largest, a little longer than wide, twice the size of 1. Club joints subquadrate, each twice the size of funicle 6.

Described from a single female on a slide from Meadeville, Pennsylvania (W. J. Phillips, Webster No. 9353).

Types.—Cat. No. 20848, U.S.N.M., the wingless specimen on a slide, a male on a tag (see below) and winged female on another slide with appendages and male wings and antennae.

The ordinary appearance of this species made me suspect that it had been mutilated but since both of the abbreviated fore wings were equal in shape and size and showed no signs of having been torn, it would be almost impossible for mutilation to have occured.

Later, two other specimens were obtained same data, one of each sex and both fully winged. Thus, in spite of the foregoing remarks the species must be considered fully winged (the other specimen mutilated miraculously). The marginal vein is twice longer than wide, slightly longer than the stigmal, the postmarginal half the length of the marginal. Marginal fringes of fore wing longer than usual (not long). Fore wing with a conspicuous mid-longitudinal fuscous stripe from apex to the middle nearly (or opposite to the stigmal vein.) Resembles the Australian *Zarhopaloides gracilis* very much. The male fore wings are hyaline, the antennae black except the scape, the long cylindrical club solid, the funicle joints distad with long scraggly hairs and elongate (1 nearly four times longer than wide, somewhat shorter than the club, 6 over twice longer than wide).

The genus *Zarhopaloides* Girault is the same as *Habrolepoidea* Howard.

ACHRYSOPOPHAGUS IO, new species.

Female.—Agrees with the description of *Achrysopophagus* Girault (the genotype) except as follows: The marginal vein is longer, the postmarginal three-fourths the length of the short stigmal; the face but feebly inflexed, the frons somewhat narrower; scape rather moderately dilated the club not much enlarged, wider and longer than the funicle; cephalic femur enlarged. Hind tibial spurs double very unequal.

Length, 1.5 mm. excluding the extruded portion of the ovipositor which is white and about three-fourths the length of the abdomen. Dark metallic green, the following parts white. Funicle, apex of scape broadly, distal two-thirds or less of the pedicel, trochanters, tarsi entirely, proximal half of cephalic femur, tips of cephalic and caudal tibiae (or caudal tibiae, distal half dorsad), proximal two-thirds of middle femur and distal two-thirds of middle tibiae. Fore wings infuscated as in *Cheiloneurus* the apex broadly hyaline; base of fore wing also infuscated. Many lines of dense cilia proximad of the narrow long hairless line of the fore wing.

Axillae with coarse scattered hairs nearly enough to form the scanty tuft on scutellum but more scattered.

Caudal wings short and broad. Head and thorax very finely densely sculptured. Funicle 6 largest much wider than long, all the funicle joints wider than long and much shorter than the pedicel which is a half longer than wide at apex.

Described from a female on a slide in the United States National Museum, labeled "No. 21. Reared from *Pseudococcus citri* on Bamboo, Manila, Compere 7–09."

Type.—Cat. No. 20849, U.S.N.M., the above specimen.

ACHRYSOPOPHAGUS NIGRICORNIS, new species.

Female.—Length, 1.45 mm., excluding the exserted portion of the valves of the ovipositor which are nearly two-thirds the length of the abdomen. Dark metallic green, the fore wings about as in the preceding species but the apex is much less broadly hyaline. Colored like the preceding except as follows: The antennae are black except pale dusky distal half or more of the scape; the legs are also concolorous except the distal three tarsal joints of the middle legs which are silvery. Scape not dilated. Cephalic coxa, femur and tibia conspicuously enlarged, compressed, distinctly more enlarged than in the preceding. Fore wings broader than in the preceding. Mandibles with three equal acute teeth as in the other. Scape scaly reticulate.

From one female labeled as the preceding but numbered "20."

Type.—Cat. No. 20850, U.S.N.M., the female on a slide.

ACHRYSOPOPHAGUS REX, new species.

Female.—Same stature as the preceding. Golden yellow, the wings infuscated as in *io*; the following metallic parts. The abdomen, valves of ovipositor and a little over the distal third of the scutum. The following black parts: Pedicel, club, funicle 6 and the dorsal half of the middle tibia, except broadly at apex. The following silvery parts: Apex of the scape, pedicel dorsad at apex not broadly; funicles 1–5, first two pairs of femora base of caudal femur, tip of middle tibia and the tarsi. Otherwise same as *io*.

Described from one female on a slide labeled "From *Pseudococcus citri* on Bamboo, Manila, Philippine Islands, Compere, July, 1909."

Type.—Cat. No. 20851, U.S.N.M., the above specimen.

HABROLEPIS ZETTERSTEDTII Westwood.

A female of this European species from *Lepidosaphes ulmi*, April 22, 1914, Monmouth, Maine, (E. H. Siegler).

COPIDOSOMA GELECHIAE Howard SAGA, new variety.

Female.—Length, 1.35 mm., excluding the ovipositor which is extruded from a fourth the length of the abdomen.

Dark metallic green, the axillae, scutellum and abdomen purplish, the body with a velvety sheen, the legs except the coxae, reddish yellow, the wings subhyaline; ventral aspect of body purple; venation dusky black, the stigmal vein with a dusky line down its proximal side. Distal tarsal joint black; basal part of hind femur purplish. Body coarsely scaly, including abdomen, the latter compressed distad, depressed above the base. Axillae just separated by a very short carina. Pedicel yellow at apex. Scape extending a little beyond the vertex, long and slender, the pedicel somewhat longer than wide, slightly longer than funicle 1 which is subequal to 2 and somewhat longer than wide; 6 a little wider than long. Club long, conic-ovate, two-thirds the length of the funicle, obliquely truncate from the base of joint 2, its joint 1 subquadrate, obliquely truncate at apex, 2 distinctly longer than wide but somewhat shorter than 3. Mandibular teeth distinct, 1 somewhat shorter than the other two. Marginal vein a little longer than wide, the postmarginal vein distinct but very short, the stigmal normal. Frons moderately broad. Head longer than wide, truncate at apex, the scrobes short, joined above. Cheeks somewhat shorter than the eyes.

Very closely allied with typical *C. gelechiae* Howard but that form has the third tooth of the mandible distinctly much shorter (evidently worn or broken) than the other, subequal two which are acute; the stigmal vein is slightly shorter; the venation yellowish; funicles 1–2 slightly longer; the pedicel not always yellow at apex; the caudal femora are all purple except at end; the caudal tibiae bear a broad purplish band a short distance below the knees.

The male antennae are filiform, the club solid, funicle 1 over twice longer than wide but shorter than the club. This form apparently the variety *b* of Howard. The funicle 6 is distinctly shorter than the solid club.

Encyrtus solus Howard resembles the species but its head is not longer than wide, its marginal vein is longer.

The Copidosomae of Australia differ notably from the above species in having the abdomen large and much compressed, the ovipositor much extruded. Some specimens of both sexes (*E. gelechiae*) reared from the larvae of *Gelechia gallaesolidaginis*, Tallahassee, Florida, had the abdomen compressed somewhat as in the Australian species but the ovipositor very short.

Type locality.—Ottawa, Canada.

Types—Cat. No. 21019, U.S.N.M., five pairs on two cards and a slide with a female head.

TYNDARICHOIDES, new genus (Encyrtini).

The characteristics of the genus are essentially those of the genotype, a description of which follows:

Genotype.—*Tyndarichoides mexicanus*, new species.

TYNDARICHOIDES MEXICANUS, new species.

Female—Length, 1.00 mm.

Dark metallic green, the wings hyaline but with a complete, slightly bowed fuscous cross-stripe from the stigmal veins apex to the distal fourth of the submarginal vein, the base infuscated slightly; the cross-stripe is somewhat over twice longer than wide; venation black; funicles 5 and 6 the club, cephalic knee tip of cephalic tibia, the tarsi, the middle femur at apex broadly, middle knee, the middle tibiae (except for three distinct black cincti, the middle longest, the third at apex, narrowest) caudal femur at apex and base narrowly (the knee capped with metallic) and caudal tibiae except for two longer cincti, the second longest (crossing at middle and extending over half way to apex) silvery white; distal tarsal joint black (also the proximal of the caudal legs), Cephalic frons (between the cephalic ocellus and the apex of the scrobes) orange yellow. A silvery lunula cephalad of the tegula (dorso-laterad). Head and thorax densely, minutely scaly and with scattered, distinct, stiff, short, normal silvery pubescence. Cephalic tarsi dusky. Head locustiform (longer than wide, narrowed ventrad and truncate there); frons moderate, not prominent, the scrobes long and straight, not quite joined above forming a long concave triangle, reaching nearly three fourths the way to the cephalic ocellus. Antennae widely separated, inserted near the mouth, capitate, the club obliquely truncate from the base of joint 3, nearly as long as the funicle and wider but not enlarged especially; scape with its dilation distinct, moderate, foliaceous. Pedicel twice longer than wide at apex, as long as funicles 1–4 united, the latter subequal, like ring-joints, slightly enlarging distad, thrice wider than long; 5 and 6 each distinctly larger but still wider than long; a small ring-joint. Mandibles tolerably long, its three teeth acute, rather strong, subequal. Marginal vein twice longer than wide, subequal to the postmarginal, the stigmal nearly thrice longer. Hairless line narrow, closed near caudal margin. Eyes rounded-ovate, somewhat shorter than the cheeks. The male is the same but the club is solid.

Described from one male, two females in the collection of the United States National Museum from Oaxaca, Mexico (Koebele).

Types.—Cat. No. 20852, U.S.N.M., the three specimens on tags, the heads of both sexes, a female fore wing, fore and middle leg on a slide.

The locustiform head (short and rounded in *Tyndarichus*), the tridentate mandibles (bidentate, the second tooth broadly truncate in the other), the somewhat smaller club and the distinctly longer stigmal vein (marginal vein two and a half times longer than wide, slightly longer than the stigmal or postmarginal in the other) distinguishes the above species from *Tyndarichus* genotype. *Tyndarichus* has the scape dilated, the club enlarged but not greatly. Types compared.

LITOMASTIX AURICOLLIS Thomson.

A species of *Berecyntus* hence, the latter is probably a synonym of *Litomastix*. Differs from *B. bakeri* in having the solid club somewhat longer but otherwise I can not distinguish between them. Synonyms very likely. One female of the European species in the United States National Museum labeled in Thomson's hand.

EXORISTOBIA PHILIPPINENSIS Ashmead.

Genotype.

Head slightly longer than wide, broadly subtruncate and narrower ventrad, the face inflexed, the scrobes forming a deep, long triangle but which does not reach the anterior ocellus, the frons moderate in width with numerous scattered large pin-punctures. Cheeks about as long as the eyes, the latter ovate. Antennae well separated, inserted below the line of the eyes. Scape with a moderate, foliaceous expansion ventrad, this broadly convex and distinct; flagellum clavate, the funicle joints all much wider than long, not annular, 6 widest, the club obliquely truncate at joint 3, the latter cross-linear or very short; club not quite as long as the funicle, wider. Marginal vein three and a half times longer than wide, the postmarginal and stigmal subequal, the latter curved each a little longer than the marginal, oblique hairless line present. Mandibles with three equal, acute teeth of moderate size. Scape yellow brown except at base.

Male flagellum filiform (club not seen), the funicle joints subquadrate, shorter than the pedicel. Sculpture (female) very fine scaliness, the thorax with punctures like those of the frons.

BLASTOTHRIX BRITTANICA, new species.[1]

In Mayr's table to *Encyrtus* runs also to *meges* Walker and allies but bears no punctures; to *sericea* Dalman but the antennae are wholly concolorous as are the legs (the middle tibiae concolorous except at each end).

Females.—Length, 1.20 mm. Dark metallic green and densely pin-punctate. Wings hyaline the venation dusky. Knees broadly, tips of the tibiae and the tarsi dull yellow to white. Proximal half of tegula silvery white. Propodeum and abdomen scaly. Scape but moderately dilated ventrad, yet distinctly so; pedicel nearly a half longer than wide at apex, longer than any funicle joint: funicle 1 a little longer than wide, subequal to 2, 3 and 4 subequal, a half more longer than wide, 5 and 6 subquadrate, widest. Club a little over half the length of the funicle, wider than it, ovate. Second tooth of mandibles broadly truncate. Marginal vein twice longer than wide, a third or more shorter than the stigmal, the latter long but somewhat shorter than the subelongate postmarginal, the latter tapering. Axillae with a short carina between them. Cheeks longer than the eyes, the frons moderately broad. Male, the same but the antennae paler, the club solid, longest, the scape short and dilated, the pedicel globular, shortest; funicle joints as in male *Eurytoma*, longer distad. In the male, the three distal veins of the fore wing are subequal, the stigmal a little the longer. Hairless line fore wing complete. Three pairs from *Lecanium capreae*, Cheshire, of England, (A. D. Imms).

Type.—Cat. No. 20853, U.S.N.M., two males, one female on a tag, appendages on a slide.

PARASTENOTERYS NIVEICLAVA Girault.

Parastenoterys niveiclava GIRAULT, Chalc. Nova Marilandensis, II, 1917, p. 1.

Female.—Length, 1.00 mm.

Dark metallic green, the scutellum bronze and lighter, the legs (except the coxae) and the scape reddish yellow, the wings hyaline, the venation yellowish. Club snow-white except the dusky basal half of the first joint. Body scaly, the abdomen subglabrous, the scutellum densely, finely punctate, a double row of punctures on the vertex, along each eye, the scutum and axillae with many, scattered setigerous punctures. Axillae barely separated or not at all. Scutellum nearly as hairy as the scutum, the hairs soft, prostrate or nearly. Propodeum glabrous, with a long, narrow median carina and a longer than wide area on each side of it which is rugulose. Tegulae concolorous. Scape subclavate. Pedicel twice longer than wide at apex. Funicle joints 3–6 subequal, each little wider than long, 1 a third longer than wide, 2 intermediate. Club ovate, equal to funicles 4–6. Mandibles reddish brown at apex, the acute second tooth twice the size of the first. Head (cephalic aspect), a little longer than wide, the scrobes forming a semicircle. Frons moderate. Postmarginal vein slightly longer than the stigmal, the latter a little over half the length of the marginal. Scutellum obtuse at apex.

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[1] The description for this species was published by Imms (Quart. Journ. Micr. Sci., vol. 63, 1918, p. 295,341, 24 text figs.) but the name accredited to Girault. Since then Silvestri (Boll. S. Z. A. Portici vol. 13, 1919, p. 164) has synonymized the name with *Blastothrix sericea* (Dalman).—S. A. ROHWER.

One female collected in the woods at Glenndale, Maryland, July 16, 1916.

Type.—Cat. No. 20854, U.S.N.M., the female on a tag, the head and a fore wing on a slide.

Differs from the genotype in having the axillae united, also the scrobes, while the teeth of the mandibles are much unequal.

Family CHALCIDIDAE

SPILOCHALCIS ALBIFRONS (Walsh).

There is a male specimen in the United States National Museum placed beside the types (two males) and labeled as this species (reared from *Apanteles militaris*, Nashville, Tennessee) but which has the face below the antennae and the first two pairs of femora entirely yellow; there is a distinct dot on the vertex near the lateral ocellus; the upper occipital margin of the eye is yellow; the pronotum bears on its cephalic margin three dots on each side of the meson; smaller in succession laterad; the spot on the scutum and scutellum is distinct while the abdomen is variegated. This is a well-marked variety.

SPILOCHALCIS TORVINA (Cresson) ANCYLAE, new variety.

Female.—Runs in Cresson's analysis to *torvina torvina* but has no head or thoracic markings except the following: Mandibles, a small round spot on each side near (not at) the clypeus, a dot between the antennae, a dot against the eye at middle of face, occipital margin of eye above, a minute transverse dot between eye and lateral ocellus, a dot on each side of meson of punctures (well separated) and one at cephal-laterad corner of pronotum, spot (oval) near parapsidal furrows on scutum near cephal-laterad corner, a dot on the parspside against the furrow, tibiae middle and caudal end; a small spot on lateral margin of scutellum at middle; abdomen as originally described (the four marks are wider than long, the distal two very much wider than long). The caudal femora differ in bearing a dot on dorsal margin at middle (showing more distinctly outwardly) and a larger than wide spot near apex beneath; outwardly a dot a little above the apex, one centrally at distal two thirds and one below further proximad.

The male differs in having a distinct inverted V-shaped marking on the lower face (as in *albifrons*); the apex of the V between the antennae and the latter embraces the black clypeus; no other head markings except the upper occipital margin of the eye; the mark on the scutum is very faint, that on parapside absent, as is also the first mark on the abdomen; apex ventral aspect of antennae reddish; the first two pairs of tibiae are lemon yellow; the hind femora has (outwardly) the basal margin yellow and the two distal dots inserted longitudinally, while the middle dot on dorsal margin has been enlarged to include nearly the proximal two-thirds of that margin (more visible from without than from within). Scape yellow. Antennae 13-jointed, one ring joint, funicle joints subquadrate, the scape compressed (in the female slender and funicle 1 is somewhat longer than wide).

Propodeum (female) very finely punctate, with a strong median carina with a tendency to branch; branched once strongly a little beyond middle; caudal margin of propodeum strongly carinated; in the male, about the same. Then the male resembles *albifrons* (types) but that species has the thorax not punctate but rugulose, while on the thorax only the dot on each side of the pronotum is present, the abdomen unmarked. A "type" of *torvina* from Texas in United States National Museum has about a dozen of the transverse markings on the abdomen and the entire venter yellow; it thus does not agree with the description and was very probably identified later; its middle tibiae bear the spurs.

A pair from Whitesboro, New Jersey, associated with *Ancylis* new species (H. B. Scammell).

Types.—Cat. No. 20749, U.S.N.M., the pair on tags, and antennae of each sex on a slide.

ACANTHOCHALCIS NIGRICANS Cameron.

Genotype.

What appears to be a small specimen of this species (the ovipositor, too, is broken off close to the base) was reared from the flat-headed apple tree-borer at Phoenix, Arizona, September 21, 1915. (A. W. Morrill.) The ovipositor valves are red, black at apex (*teste* specimens in the United States National Museum), while the antennae are 12-jointed, the last joint smallest except the pedicel, conical; pedicel hardly larger than the ring joint. Antennae inserted slightly below the ends of the eyes, the scrobes reaching the anterior ocellus, deep. The generic characters are the unclubbed 12-jointed antennae, the long ovipositor and the propodeum which has a short horn at meson near base (*unispinosa*) from which it is declivous but laterad, is plane and depressed, which from the lateral aspect forms a projection over the pleurum; this projection resembles a stout coxa.

ACANTHOCHALCIS UNISPINOSA, new species.

Female.—Length, 18.00 mm.

The same as the genotype but the propodeum bears a short, stout tooth at meson near base while from lateral aspect the flattened lateral part of the propodeum does not project over the caudal metapleurum. Funicle 1 thrice longer than wide (nearly thrice longer than wide in the other); the propodeum bears a median carina (three rugae in the other at meson). Forewings smoky in both, the venation black, the postmarginal vein longer than the marginal. Hind wings clouded distad. Femoral furrows deep (for first and second legs). Abdomen with no conspicuous patches of pubescence, nor the hind coxae nor the subdued prominence on the propodeum while the scutellum at distal half is obtusely biparted by a deep, obtuse median "valley."

One female in the United States National Museum, Texas (Belfrage).

Type.—Cat. No. 20752, U.S.N.M., the female on a pin and antennae on a slide.

DIPLODONTIA SECUNDA, new species.

Female.—Length, 6.50 mm.

Yellow, the wings infuscated but lighter toward the tip, the body marked with black as follows: Antennae except the bulla and ventral aspect of scape (also lower sides near base), upper half of occiput except eye margin, the black continuing over the vertex and down the face to the antennae (the eye margin more broadly yellow on the face, the ocelli lined with yellow mesal) the upper face of pronotum, pronotum except cephalic margin and broadly mesad (where it is a mere line), the propleurum except cephalic margin and ventral half, scutum except lateral margins narrowly except at each end, parapsides except lateral margin (more broadly cephalad), mesal half of axillae, a broad median stripe two-thirds of the way down the scutellum, propodeum except the spines and the convex protuberance and plate near the hind wings, mesopleurum, ventral half of metapleurum, meso- and meta-venter, hind coxae except a large fusiform area from base (basal dorso-laterad, a large hooklike marking on hind femur, inner aspect, from apex to beyond middle (along the lower side) a large comma-shaped marking on same, lateral aspect, about middle, its pointed end not reaching tooth 4; base of hind tibia; a dot, each side, apex of petiole; a V-shaped marking base of segment 2 nearly to its apex; five narrow cross stripes, 1–2 most distinct, 1 near apex of segment 2, 2 about the middle. Postmarginal vein somewhat shorter than the marginal. Tooth 6 of hind femur broadest, serrulate. Antennae 13-jointed. Funicle 1 a half longer than wide; propodeum foveate. Pubescence fuzzy. Abdomen normal, the pedicel nearly twice longer than wide.

One female, Long Island, New York.

Type.—Cat. No. 20750, U.S.N.M., the female on a pin, an antenna on slide.

Family EULOPHIDAE.

CHRYSOCHARODES MAJORIANA Girault.

Chrysocharodes majoriana GIRAULT, Descr. Hym. Chalc. Var. cum Observ., 1917, p. 10.

Female.—Length, 0.70 mm.

The club is 3-jointed while the male scape is merely compressed. Differs from all the North American species of *Omphalchrysocharis* in having the legs and scape entirely white except the first pair of coxae. Third ring-joint larger, colored; funicle 2 twice longer than wide, a little longer than 1 which is subequal to club 1 and a little longer than the pedicel; other club joints shorter. Postmarginal vein elongate. Mandibles with two equal teeth and a very minute third one at base of the second within. Petiole quadrate. Propodeum with narrow lateral carina but no median, the spiracle very minute and round. Parapsidal furrows incomplete but caudad represented by a long depression. Scaly.

The male is the same but the coxae are metallic, the scape also at extreme apex, while the flagellum bears long hairs (in the genotype male, the funicle joints are narrowed distad and the club 2-jointed).

Three males, one female reared from a leaf miner on *Commelina virginica*, St. Vincent, British West Indies, F. Watts.

Types.—Cat. No. 20839, U.S.N.M., the specimens on tags, a head of each sex on a slide. Also male from a leaf-miner on Cassia, same place.

PSEUDIGLYPHOMYIA PULCHERIA, new species.

Female.—Length, 1.55 mm. Rather elongate.

Bright yellow, the wings hyaline, the following parts dark metallic green: Upper half of occiput except the margins, ocellar area, a stripe from apex of each eye to apex of head along the genal suture and broad, scape and pedicel except apex of each beneath, hind coxae, prothorax, over cephalic half scutum except the lateral margin narrowly, a dot on apex (cephalad) of the axillae, apex of tegulae, rest of thorax (caudad of scutum and the axillae) except the mesopleurum just under the tegula; meson of ventral abdomen broadly nearly to apex, same more broadly dorsad from a broad basal stripe whose length is equal to the space from apex of the mesal green to abdomen's apex; the dorsal green swells laterally and nearly reaches the margins to which from it run our narrow arms (as of the ends of cross-stripes), one on each side of the center being prominent. Like the other species. Mandibles 4-dentate, the teeth nearly equal. Postmarginal vein subequal to the stigmal.

One female, Wellington, Kansas, E. G. Kelly.

Type.—Cat. No. 20837, U.S.N.M., the female on a tag, a hind leg and a fore wing on a slide.

EMERSONELLA FUSCIPENNIS, new species.

Female.—Similar to the genotype but the abdomen is more depressed and bears a short petiole, the lateral carina is a little more mesad, only the cephalic tibia is entirely pale, the fore wing is dusky to apex from the distal half of the marginal vein, the hind wings are lightly dusky, the mandibles are 4-dentate, the club is subequal to each of the other flagellar joints (excluding pedicel), not distinctly longer, the funicle joints a half longer than wide. Also, the pronotum is distinct. Head finely sculptured beneath the antennae.

One female, Turrialba, Costa Rica (Schild and Burgdorf).

Type.—Cat. No. 20838, U.S.N.M., the thorax on a tag, the head, a pair of wings, and a hind leg on a slide.

ACHRYSOCHARIS CAMILLI, new species.

Female.—Length, 0.85 mm.

Agrees with the description of (*Derostenus*) *Achrysocharis fullowayi* (Crawford) but the fore wings bear a distinct substigmal cross-stripe and the proximal two thirds of the scape is pale. Mandibles tridentate. Flagellar joints more or less subquadrate. Densely, finely punctate (glazed). Parapsidal furrows complete. Postmarginal vein shorter than the stigmal, the marginal fringes very short. Ring-joint very short.

Five females reared from an *Agromyza* on alfalfa, Elkpoint, South Dakota, July 27, 1916, C. N. Ainslie.

Types.—Cat. No. 20826, U.S.N.M. The females on a tag and a slide.

Mr. Gahan has identified these specimens as *fullowayi* of Hawaii but because of the differences pointed out and the different localities, it is wiser, I think, to keep the two separate. But I have only seen the description of *fullowayi* not the type. It should have a concolorous scape and a substigmal *spot.*

RHICNOPELTOMYIA MARYLANDI, new species.

Female.—Length, 1.00 mm.

Differs from *marylandensis* in that there is but the substigmal spot on the fore wing, the postmarginal vein is subequal to the stigmal, the coxae are metallic except at apex and the hind femur so laterad between base and middle but not along the margins; the mandibles bear larger teeth, are bidentate only, the first tooth largest. From *Achrysocharoides* in having the third ring-joint large, the two funicle joints are twice longer than wide, longer than the pedicel, the club is acuminate, the substigmal spot small and so on. Differs from *Achrysocharis camilli* in the fore wings, mandibles and so on. Scape white at proximal half. (Head as in *Pleurotropis*.)

One female, Glenndale, Maryland, woods in August.

Type.—Cat. No. 20828, U.S.N.M., the female on a tag, a head on a slide.

RHICNOPELTOMYIA CARLYLEI POETA, new variety.

Female.—The same as *carlylei carlyei* but of the head only the clypeus is yellow, the abdomen is dark brown, the legs are dusky black except the knees, tips of tibiae and the tarsi, and the antennae are dusky except apex of scape and pedicel, more or less. Types compared.

From one female, Chevy Chase Lake, Maryland, April 24, 1915.

Type.—Cat. No. 20856, U.S.N.M. The female on a tag, the head on a slide.

ACHRYSOCHARELLA SILVIA Girault..

Achrysocharella silvia GIRAULT, Two New Achrysocharellae, 1917, p. 1.

Female.—Length, 1.20 mm.

Differs from *Derostenus punctiventris* Crawford, in that there are two ring-joints (funicle 1 is subquadrate and a little shorter than 2), the scape is white at proximal half and the substigmal spot is much more distinct, reaching nearly to the caudal wing margin. The body is stouter and the cephalic tibia is black ventrad. Annulus near base of middle and caudal tibiae, distinct. Parapsidal furrows complete. Mandibles tridentate. Types compared.

From one female, Glenndale, Maryland, April, in the woods.

Type.—Cat. No. 20827, U.S.N.M., the specimen on a tag, the head on a slide.

ACHRYSOCHARELLA PARTIAENEICEPS Girault.

Achrysocharella partiaeneiceps GIRAULT, New Eulophidae, 1917, p. 1.

Female.—A little smaller than *Rhicnopeltomyia carlylei* and differing from it as follows: The abdomen as in the variety *poeta* of that species; the ocellar area and the upper half of the occiput are bright metallic green (the ocellar area large, so that the vertex is metallic except a narrow cross-stripe along the occipital margin and which connects with a similar yellow line along the occipital edge of the eye); the legs are golden yellow except the caudal coxa; the propleurum is all metallic; the antennae are yellow except the scape above and the pedicel at base broadly; the two ring-joints are large, the pedicel only slightly longer than wide; the funicle joints are subequal, subquadrate; the terminal nipple of the club is minute and like a "bud," not spine-like and distinct; and the post-marginal vein is distinctly longer than the stigmal, *subelongate* (both veins short in *carlylei*, the postmarginal very short). Parapsidal furrows complete. Mandibles tridentate, apparently not finely serrate within as in *carlylei*.

From two females, Hillmead, Prince Georges County, Maryland, woods.

Type.—Cat. No. 20834, U. S. N.M. The females on a tag, a head on a slide.

SYMPIESOMORPHELLEUS MEDIOLINEATUS, new species.

Female.—Similar to *nigriprothorax* Girault but of the prothorax only the meson very broadly dorsad and the upper edge of the cephalic face is black, there is a black area at meson of cephalic margin of scutum, longer than wide, irregular one on the axilla from a little laterad of the middle of its cephalic margin, the dorsal thorax laterad of the postscutellum is black; the propodeum is black except rather broadly along the meson (more broadly distad), leaving the median carina entirely free of black; and the abdominal markings are more distinct. Thus very similar to *californicus* but aside from the entirely black prothorax in that species, here the distal fourth of the abdomen above is black (there is a narrow cross-stripe just preceding this black, too, but in *californicus* this stripe is absent, the median stripe not quite reaching the apex), the median stripe of the abdomen is complete and more robust, the head (except the granulate clypeus) is glabrous (not scaly) as is also the entire dorsal thorax. Otherwise very much like *californicus*. Mandibles 8-dentate. Scape more or less pale at extreme base.

From the woods, one female, Glenndale, Maryland, October 6, 1916.

Type.—Cat. No. 20640, U.S.N.M., the female on a tag, the hind tibiae and the head on a slide.

CHRYSONOTOMYIA AURIPUNCTATUS Ashmead.

Genotype.

The head is missing but the body is like the Australian *Achrysocharis grandis* Girault and the species is undoubtedly an Omphaline. The generic description does not apply at all. Type examined.

HOPLOCREPIS ALBICLAVUS Ashmead.

Genotype.

Head (cephalic aspect) elliptical (the axis transverse), the round eyes forming the poles, the head about twice wider than long (excluding the clypeus which projects, the antennae inserted a little below the middle but much above the ventral ends of the eyes, the cheeks distinct, their aspect nearly ventral; scrobes short. Ocelli in a triangle. One short ring-joint, funicle 4-jointed (club not seen). Parapsidal furrows complete, distinct, not reaching pronotum, the parapsides shortened and rather humped cephalad. Scutum with a sharp median carina, abbreviated at each end. Scutellum with its disk or dorsal aspect sharply margined except at base and with a Y-shaped carina along the meson formed by two elbowed carinae, the prong distad, no grooves, the space between the carinated margins and the central carina honeycombed. Propodeum glabrous, with a pair of very narrow, long median carinae and a lateral carina. Petiole a little over twice longer than wide, with the carinae longwise (dorsal aspect). Segment 2 of abdomen occupying a little over a third of the surface, 3 half its length (that of 2), the others short. A tuft of black hairs at the distinct break of the submarginal vein, the latter as long as the long marginal, the stigmal of moderate length, long for the tribe, not sessile, a little shorter than the postmarginal.

The male is similar but has a very slender flagellum, its funicle joints (4) nodular at base, their slender portions not twice the length of the more or less ovate nodules, the club solid but apparently 2-jointed by a constriction a little before its middle, its terminal spine distinct, the club somewhat longer than the funicle joints, its two parts and the funicular nodules clothed with long silky hairs. Ring-joint in the male obsolete, the pedicel smallest. Male antennae 7-jointed.

From a pair from the West Indies and identified by Ashmead. Description of female thorax, abdomen, wing and caudal leg from the type of *H. grenadensis* Howard.

NEOMPHALOIDELLA FUMIPENNIS Girault.

Neomphaloidella fumipennis GIRAULT, Chalc. Nov. Marilandensis, 1917, p. 2.

Female.—Length, 1.25 mm.

Dark metallic green, the knees, tibiae, tarsi (except last joint) and antennal scape (except above), golden yellow; fore wing distinctly infuscated from near the base of the marginal vein distad to the length of the stigmal vein distad of the apex of the latter, the infuscation fading caudad. Head and body with the usual uniform sculpture, the propodeum with a flat median carina and no others, the spiracle moderately small, rounded; a sparse line of setae along the lateral margin of the scutum. Stigmal vein elongate. Mandibles tridentate. Abdomen usual. Second two ring-joints very short, the pedicel nearly twice longer than wide, shorter than funicle 3; funicle 1 longest, over twice longer than wide, 2 and 3 subequal, each about twice longer than wide, longer than any club joint; club with a distinct terminal spicule.

One female. Swept from woody fields, Glenndale, Maryland, June 14, 1916.

Type.—Cat. No. 20444, U.S.N.M., the female on a tag, the head and a fore wing on a slide.

NEOMPHALOIDELLA IXTLILXOCHITLI, new species.

Female.—Length, 0.90 mm.

Black and scaly, the scape and coxae white, the distal two club joints suffused with white, the following parts yellow: A narrow loop from antenna to antenna, ventrad legs (the middle and caudal femora and tibiae more or less dusky) and a little over basal fourth of the abdomen, except the lateral margins. Fore wings hyaline but bearing a conspicuous, moderately larger, round fuscous spot in the middle of its blade, suspended from the apex of the stigmal vein. Pedicel and funicle 1 elongate, the former about thrice longer than wide at apex, clavate, a little longer than funicle 1 which is thrice longer than wide; 2 elliptical oval, a half longer than wide, wider than 1; 3 oval, a little shorter than 2. Club ovate, about as long as the pedicel excluding the distinct terminal spines which is as long as its third joint. Propodeum rugulose yet with a distinct median carina, the spiracle moderately small round, its own diameter from the cephalic margin. Mandibles tridentate. No noticeable punctures on thorax but scattered minute ones occur.

From one female, Cordoba, Vera Cruz, Mexico (Dr. A. Fenyes).

Type.—Cat. No. 20857, U.S.N.M., the female on a tag, the head and a fore wing on a slide.

TETRASTICHUS FASCIATUS Ashmead.

The color is golden yellow with five narrow cross-stripes on the abdomen; the few punctures along lateral margin of scutum very minute, setigerous. Propodeum with no lateral carina, very short, more so at the meson, the spiracle oval. Scutellum with two, long black setae along the lateral side of the first or mesal groove distad of middle. Funicle 1 twice longer than wide, 3 somewhat shorter, subequal to the pedicel. Short "stylus" of abdomen black. Forewings broad. A well-marked species, the club bearing a spicule at apex. There are three ring-joints, the third short.

Seven females compared with the types and reared in the type locality from *Cecidomyia manihot* (F. Watts).

OPHELINOIDEUS JAPONICUS Ashmead.

Genotype.

Antennae inserted somewhat below the middle of the face but above the ventral ends of the eyes, 9-jointed with two ring-joints, the club 2-jointed, funicle 1 elongate. Mandibles stout, 5-dentate, the inner three teeth feeble. Caudal tibial spurs double, stout. Club with a minute terminal nipple, about equally divided. Marginal vein distinctly shorter than the broken submarginal, over twice the length of the large stigmal, the postmarginal longer than the stigmal. Form as in *Secodella* but ciliation of the forewing normal. Parapsidal furrows deep, complete. Scutellum simple, rectangular. Propodeum with a strong, acute median carina only, the spiracle elliptical, large, cephalad. Body strongly scaly. Original description otherwise correct but the tibiae and scape are reddish and the forewing bears a fuscous spot, oblique and small, from the base of the marginal vein and besides are lightly stained centrally, especially cephalad.

From the types in the United States National Museum.

COMEDO NEOMEXICANUS, new species.

Female.—Similar to *orgyiae* Fitch but the orange marking on the base of the abdomen is very much larger, occupying half of the dorsal surface except for a small triangle at meson at base. In *orgyiae*, it is a cross-stripe (not very broad) a little out from base. Median carina of propodeum distinct in both, no lateral carina. In *neomexicanus*, the abdomen ventrad is orange only for basal fourth except along each margin (ventral aspect). Funicle 1 over 2½ times longer than wide, much longer than the pedicel. Wings hyaline.

Many females from foliage of cottonwood, Roswell, New Mexico, (R. J. Fiske), August 14, 1916.

Types.—Cat. No. 20603, U.S.N.M., four females on tags, a head on a slide.

In this genus the mandibles are weak, edentate, subacute at apex, somewhat as in *Euplectrus*. In the analysis of the species printed in Proceedings U. S. National Museum, (vol. 43, 1912, p. 186, at 5,) the words "Lateral carina" in both paragraphs should read "Median carina."

COMEDO SMERINTHI Ashmead.

One female, September 24, 1916, Glenndale, Maryland.

EPITETRASTICHUS VARICORNIS Girault.

Epitetrastichus varicornis Girault, Descr. Hym. Chalc. Var. cum Observ., 1917, p. 4.

Female.—Length, 1.00 mm. Stout, the abdomen short, larger than the thorax aeneus black, the wings hyaline, the venation black; tips of tibiae (all of cephalic tibiae nearly), knees and tarsi dull yellow. Club of antennae silvery white, the funicle joints pale ventrad, also the pedicel except above at base. Sculpture usual; a line of weak punctures along the lateral margin of the scutum. Propodeum and abdomen scaly, the former with a strong median carina and no others, the spiracle small, round. Scape compressed. Pedicel subequal to funicle 2, funicle 1 about twice longer then wide, 3 quadrate; club short, ovate, its terminal nipple slight; club 1 hemispherical, twice the width of funicle 1. Mandibles tridentate. A very short postmarginal vein, the stigmal of moderate length.

From one female taken in open woods, May 15, 1916. Prince Georges County, Maryland.

Types.—Cat. No. 20858, U.S.N.M, the female on a tag, the head on a slide.

EULOPHUS BORROWI Girault.

Eulophus borrowi Girault, Descr. Hym. Chalc. Var. cum Observ., 1917, p. 9.

Female.—Length, 2.00 mm.

Dark metallic green, the wings hyaline, the scape, tegulae and legs (except the coxae, caudal femora lightly, other femora more or less and apex of caudal tibiae), pale yellowish. Head and thorax densely, scaly punctate (the head very finely so), the propodeum scaly, also the abdomen except segment 2. Scutellum with a thin carina on each side in the site of the usual lateral groove. Propodeum tricarinate, the spiracle large, round cephalic. Marginal vein a little over twice the length of the stigmal, the postmarginal distinctly longer than the stigmal. Pedicel somewhat longer than wide at apex. Funicle 1 over twice longer than wide, 2 and 3 large, subquadrate; club ovate, its three joints distinct, also a small terminal spine. First ring-joint very short. Mandibles 5-dentate.

Two females Placer County, California, August.

Types.—Cat. No. 20860, U.S.N.M., the specimens minutien-mounted, a head and caudal legs on a slide.

DIMMOCKIA MARYLANDICA, new species.

Female.—Length, 1.05 mm., rather small.

Very dark metallic green, the wings hyaline, the venation dusky, the legs black except the white knees and the yellowish trochanters, proximal three tarsal joints, apex of tibiae broadly and distal two-thirds of cephalic tibiae; base of body of the scape pale. Pedicel somewhat longer than funicle 1 which is cupshaped and as long as wide, the other three joints subequal, nearly twice wider than long; club nippleless, divided a little before middle. Mandibles 8-dentate. Antennae inserted on a level with the ventral end of the eyes. Clypeus with a convex distal margin. Head and thorax scaly-punctate, the propodeum glabrous, with a strong median carina and smooth lateral sulcus, the spiracle moderate, elliptical-oval. Propodeum with a short neck. Parapsidal furrows complete, five lines. Pronotum subtransverse-quadrate, half the length of the scutum, the latter more coarsely sculptured than the scutellum. Abdomen sessile, flat above, oval, segment 2 occupying half of the surface, glabrous, the other segments scaly. Abdomen a little wider but no longer than the thorax. Marginal vein nearly thrice the length of the long stigmal, the latter distinctly shorter than the postmarginal.

One female, Glenndale, Maryland, October 4, 1916.

Type.—Cat. No. 20861, U.S.N.M., the female on a tag, hind tibiae and head on a slide.

Genus ASTICHOMYIIA Girault.

Astichomyiia GIRAULT, Descr. Chalc. Var. cum Observ., 1917, p. 4.

Female.—Like *Achrysocharis* Girault except that the scape is greatly flattened, the middle of its lower margin being the summit of the convexity. Club with a terminal spine nearly as long as the joint bearing it. Postmarginal vein subequal to the stigmal. Mandibles bidentate, the second tooth much shorter. Parapsidal furrows represented by impressed areas caudad. Propodeum noncarinate.

ASTICHOMYIIA LATISCAPUS Girault.

Astichomyiia latiscapus GIRAULT, Descr. Chalc. Var. cum Observ., 1917, p. 4.

Genotype.

Length.—1.00 mm.

Dark metallic green, the wings hyaline, the knees, tibiae (except middle tibiae shortly at base) the tarsi white, also the pedicel; rest of antennae black. Scaly punctate, the propodeum glabrous. Funicles 1–2 subequal, somewhat longer than wide and the pedicel, the club joints shorter, 2 quadrate. Ring-joint minute.

One female reared with some tetrastichines from small spherical galls on avocado leaves, Tampico, Mexico, January, 1914 (D. L. Crawford).

Types.—Cat. No. 20835, U.S.N.M., the female on tag; the head, a pair of wings, a cephalic leg, and a middle tibia on a slide.

DIAULINOPSIS CARLYLEI (Girault).

Diaulinus carlylei GIRAULT, Descr. Hym. Chalc. Var. cum Observ., 1917, p. 6.

Female.—Length, 1.30 mm.

Dark metallic green, the wings hyaline; apex of femora rather broadly, knees cephalic tibiae excepting for a narrow cinctus just out from base about as long as its distance from base, basal half of middle tibiae excepting for a similar basal cinctus, apex very narrowly of middle and caudal tibiae and a little less than proximal half of caudal tibiae (except from the narrow cinctus near base), yellowish white; tarsi dusky, whitish at base. Body finely scaly reticulate. Trace of a very delicate median carina on the propodeum, the spiracle round, not at cephalic margin. Postmarginal vein nearly two-thirds the length of the marginal, longer than the rather long stigmal. Funicle 1 twice longer than wide, 2 somewhat shorter; club quadrate, the others a little shorter, 3 with a distinct nipple whose proximal half is thicker than the other and which is distinctly shorter than joint. Pedicel a little smaller than joint 3. Mandibles 5-dentate. Scape cylindrical, not long. Agreeing with the generic description.

Described from one female in the United States National Museum from Alameda County, California. (Coquillett).

Types.—Cat. No. 20862, U.S.N.M., the specimens on tags and a slide bearing a caudal leg and a head.

Family EUCHARIDAE.

ISOMERALIA AZTECA, new species.

Female.—About half the size of *coronata* Westwood (a specimen in the United States National Museum from Brazil) and agreeing with that species except as follows: The distal third of the abdomen is rufous; the scutum is more coarsely cross-striate; the vertex and scrobes are less uniformly densely pin-punctulate, the face also, the latter with fine cross-striation. Otherwise the same. Thorax with a median sulcus from about the center of the scutum to apex of scutellum, thinner on the scutellum. Axillae rectangular and face to face (forming a rectangular sclerite between scutum and scutellum). Upper frons with a conspicuous obtuse tubercle on each side of the scrobes; the eyes conical or like mammae. Petiole about thrice longer than wide, coriaceus, its lateral margin carinated. Antennae 16-jointed, the club long solid, no ring-joints; funicle joints all wider than long except 1, which is slightly longer than wide; pedicel small, club ovate. Male antennae 11-jointed, the eight funicle joints subequal, twice wider than long, each with a long branch of equal length from the same side, the club quadrate, with a smaller branch from its side and another from its apex. Pedicel cup-shaped, longer than any following joint.

From two males and two females on tags. Tampico, Mexico, June; and a male from Guatemala (Schwarz and Barber).

Types.—Cat. No. 20863, U.S.N.M., the first four specimens.

Family EURYTOMIDAE.

EURYTOMA PHOEBUS, new species.

Female.—Like *vagabunda* but the propodeum on each side of the median channel is densely silvery pubescent and the median basin at about distal half is distinctly carinated at lateral margin but this carina is straight not curved at its distal fourth as in *vagabunda.* Also the tegula is reddish yellow only at apex. Types compared.

From two females reared from *Elymus canadensis* May, Elk Point, South Dakota (C. N. Ainslie).

Types.—Cat. No. 20864, U.S.N.M., the specimens on tags.

EURYTOMA PHOENIX, new species.

Female.—Like *stigmi* Ashmead but at once distinguished in having a distinct abdominal petiole which is over twice longer than wide, as long as the caudal coxae (in *stigmi,* wider than long) and the median channel of the propodeum is double except at apex (distad) where it terminates in a large, quadrate fovea; also a fourth longer than *stigmi.* Tibiae yellow, the caudal tibiae nearly so, more or less dark. Abdomen above polished, the petiole densely scaly-punctate. Compared with type of *stigmi.* Funicle 1 nearly twice longer than wide. The male has the caudal tibia entirely black, the abdominal petiole much longer than the caudal coxa, densely, finely punctate; funicle 5-jointed.

Described from several males and females taken from an orchid, San Mateo, California (F. Maskew).

Types.—Cat. No. 20630, U.S.N.M., two males, three females on tags.

EURYTOMA NEOMEXICANA, new species.

Female.—Like *succinipedis* Ashmead but a half smaller and differing in the following particulars: All the coxae are reddish yellow (but may be more or less blackish), the caudal and middle tibiae are black except at tips, the caudal femur may be black laterad and the middle are so above more or less; the tegulae are blackish; the head and thorax is not umbilicately punctate but only densely scaly (hence *Xanthosoma*) but the scutellum is reticulated, the lines raised, the propodeum rugulose, the median channel of the propodeum is double from a little over proximal third and no distinct basin is present (limited by a large V-shaped carina in *succinipedis*). Venation pale, the stigmal vein a little over half the length of the marginal, distinctly shorter than the submarginal; segment 5 of abdomen longest, not as long as 2–4 combined, the abdomen polished above, not much convexed, its petiole a little wider than long. Funicle 1 somewhat longer than wide. Funicle 1 nearly twice longer than wide, 5 wider than long; scape red at proximal half. Two caudal tibial spurs.

The male has the legs all reddish yellow but otherwise the same; scape with a convex hump ventrad a little distad of middle, the club solid and a little longer than funicle 1 which is nearly thrice longer than wide, 5 nearly twice longer than wide.

One male, three females, Koebele, New Mexico, in connection with *Isosoma* (V. L. Wildermuth).

Types.—Cat. No. 20627, U.S.N.M., the specimens on tags, antennae on a slide.

EURYTOMA POLONI, new species.[1]

Female.—About half the size of *systoloides* Crawford and differing from that species notably in having segment 4 of the abdomen much longer than 5 of the other, as long as the preceding two segments united, the first segment 2, from dorsad rectangular (longer than wide), its lateral margins distinctly carinated; also the cephalic tibiae are more distinctly wholly reddish yellow while the flat, large propodeal basin has no paired channel at base in the other species and is not finely punctate but instead bears a median ruga and several radiating rugae from the apex of the median one, is scaly and laterad bounded by a distinct, straight lateral carina (it is somewhat wider than long). Differs from *browni* Crawford similarly as to size and has not the markedly compressed abdomen present in that species and the propodeal basin is not limited laterad by the marked ridge as in *browni* and bears the longitudinal rugae (not present in that species). Differs from *banksi* Ashmead in having the caudal tibia black to tip

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[1] A detailed description of this species is given by Otanes y Quesales in Phil. Agric., vol. 7, 1918, p. 24. In this publication the species is accredited to Girault, but the description is based on specimens in the Philippine Agricultural collections, and the type should be selected from these. S. A. ROHWER.

or nearly; *browni* also has segment 4 longest but much shorter than in *poloni* and wholly polished-direct dorsal aspect, *banksi* has a paired median channel on the propodeum and segment 5 of the abdomen is longest.

Black except the bulla of scape, knees, tips of tibiae and the tarsi, the latter whitish. Umbilicately punctate. Venation pale, the stigmal vein slightly shorter than the marginal, the latter subequal to the postmarginal. Abdominal petiole very short, the abdomen usual in shape. Body as in *Bruchophagus funebris*. Abdomen glabrous dorsad except the proximal third of segment 4 and all of the small segment 5. A button-like tubercle at base of abdomen on each side of the petiole. Pedicel globular; funicle 1 a half longer than wide, the others moniliform; club 2-jointed, 1 a little wider than long. Types compared.

The male is similar except for sexual characters. Its antennae are similar in segmentation but the funicle joints are exercised and with whorls of long hairs, the club about equally divided.

Described from numerous pairs reared from the larvae of an *Agromyza* in bean roots. Los Baños, Luzon, Philippines (C. F. Baker). February, 1916.

Types.—Cat. No. 20865, U.S.N.M. Two males, five females on tags, male and female antennae, female caudal legs and fore wings on a slide.

The species is respectfully dedicated to Marco Polo.

EURYTOMA ILLINOISENSIS, new species.

Female.—Differs from *maculipes* in having the scape black except at base, the caudal tibiae are less broadly reddish at apex, the postmarginal vein is subequal to the stigmal, segment 5 of the abdomen somewhat shorter, funicle 1 is somewhat longer, while the propodeum on each side of the meson is coarsely rugulose, has no distinct basin and the median channel is deep, simple, not distinctly bifoveate at base. From *stigmi* Ashmead in that the median channel of the propodeum does not enlarge at base and is but feebly bifoveate there, and the stigmal and postmarginal veins are shorter, the venation paler. Closely allied with *stigmi* Ashmead. Funicle 1 over twice longer than wide at apex; club 2-jointed, 2 is long as funicle 1.

Described from two females, Urbana, Illinois. Reared in connection with *Isosoma.* (R. D. Glascow).

Types.—Cat. No. 20629, U.S.N.M. Two females on tags, caudal tibiae and an antenna on a slide.

Also, females reared from *Elymus*, Taber, South Dakota (C. N. Ainslie); in one of these the middle tibia was black dorsad only.

EURYTOMA PATER, new species.

Female.—Length, 1.80 mm.

Black, the wings hyaline, the venation dark brown, proximal third of scape yellow; cephalic legs, middle legs except most of the coxae and the dorsal aspect of middle tibia, caudal knees, tips of tibiae and the tarsi reddish Entire ventral aspect of scape more or less reddish. Face with a silvery pile; of the usual sculpture. Postmarginal vein distinctly shorter than the marginal, somewhat longer than the stigmal. Petiole of abdomen wider than long, the abdomen shaped somewhat as in *Isosoma*, polished, segment 5 as long as 2–4 combined or nearly; scaly sculpture sparse and light. Propodeum coarsely rugulose, the median basin indefinitely limited, finely punctate in a small area centrally against the distinct median channel (but this area is often much coarser), the latter double for nearly half its length. Flagellum slender; funicle 1 somewhat over thrice longer than wide, 2 over twice longer than wide, 5 a half longer than wide. Club 2 as long as funicle 1. Allied with *auriceps*.

Described from two females reared in connection with *Isosoma*, Youngstown, Ohio (type) and Penn Yan, New York, (W. J. Phillips). Also at Auburn and Waterloo, New York; and Tulsa, Oklahoma.

Type.—Cat. No. 20628, U.S.N.M. A female, from Ohio, on a tag with a slide bearing a caudal leg and an antenna.

Also a female from Charlottesville, Virginia (W. T. Emery). In this specimen the caudal femur was red except above centrally, the coxa and tibia black.

EURYTOMA HEGELI, Variety MAGA, new variety.

Female.—Of the same stature and so forth as *hegeli* but somewhat smaller and differing as follows: The marginal vein is longer and more slender, the median black of the pronotum does not spread distad to any extent, the parapsides are black except laterad, the lateral and distal margins of the scutellum are narrowly black (sometimes broadly), the black median line of segment 5 of the abdomen is of uniform width nearly, that of 6 is thicker at apex while 7 has also the meson black. Types compared.

From several females (only one type) in the United States National Museum on tags labeled "2972° June 14, 1883."

Type.—Cat. No. 20866, U.S.N.M. One female on a tag.

EURYTOMA BOLTERI Riley PARVA Phillips.

Eurytoma bolteri, var. *parva* PHILLIPS, U. S. Dept. Agr. Farm Bull., 1006, 1913, pp. 11, 14, fig. 17. [Variety here accredited to Girault.]

Both sexes from Youngstown, Ohio. Three specimens were very much smaller than the typical form and the scape was sometimes wholly black, also the marginal vein was slightly longer. Otherwise, however, they agreed with the types of the typical form but may be distinguished by having the median channel of the propodeum single at distal fourth. But this varies somewhat in the typical form. Of the latter, three females, Falls Church, Virginia (R. A. Cushman), from lepidopteron galls on *Solidago*.

Also the variety at Front Royal, Virginia, Holliday, Utah, and Waterloo, New York.

NEORILEYA FLAVIPES Ashmead.

The parapsidal furrows are complete. From the type.

DECATOMA FLAMMINNEIVENTRIS, new species.

Female.—Length, 2.45 mm.

Reddish yellow, the head and legs honey yellow; ocellar area narrowly, occiput circularly above the center, a triangular spot at meson of caudal margin of pronotum, median line of scutum broadly, scutellum except the lateral and caudal margins narrowly, cephalic margin of propodeum except laterad, median channel of same to the neck and petiole at apex, black. Substigmal blotch of fore wing round or ovate, reaching only about a third of the way across. Funicle and club dark brown (in one specimen). Umbilicately punctate, moderately coarsely so, the propodeum rugose with a distinct median channel. Abdomen shining, somewhat compressed, segments 2, 4 and 5 subequal. Pedicel a little longer than funicle 1, over twice longer than wide at apex. Eyes naked.

The male has the spot on the pronotum larger and connected along the meson with the black cephalic face of prothorax, the axillae are tipped with black mesad, the much longer petiole is black above except marginally, while the caudal coxa bears an elongate spot from base, lateral aspect.

Two pairs, parasitic upon *Prodoxus decipiens*, Fort Collins, Colorado, September 19, 1893 (C. F. Baker).

Types.—Cat. No. 20867, U.S.N.M. The above specimen on tags.

DECATOMA FLORIDA, new species.

Female.—Similar to *marilandica* but the mouth is narrowly yellow, the coxae black, the legs lemon yellow and the propodeum has only the dorso-cephalic corner widely yellow; also the tegula is yellow. Segment 3 of abdomen distinctly shorter than 2 or 4, the abdomen glabrous, otherwise as in the named species but the median channel of the propodeum has a large round fovea at base, the basin less rugulose.

Two females, Jacksonville, Florida (W. H. Ashmead).

Type.—Cat. No. 20868, U.S.N.M. Two females on tag.

DECATOMA MICHIGANICA, new species.

Female.—Length, 2.10 mm.

Honey yellow, the fore wings with but a minute substigmal spot. the body marked with black as follows: Ocellar area, upper occiput (in the shape of a cresent at the vertex only), cephalic face of pronotum except laterad, a minute dot (one specimen) at meson of pronotum, cephalad; a triangular area from cephalic margin of scutum (except far laterad) to middle, thence acuminately to distal margin, caudal margin of pronotum across the meson, disk of scutellum in the form of a miter (clavate and near its widest part-distad with acute, toothlike lateral projections (one from each side); cephalic margin, medial basin and spiracular line of propodeum, petiole and median line of abdomen to middle of segment 6, very narrowly on 6, terminating in a dot, more broadly elsewhere and spreading transversely at the end of each segment (notably, the first three); pedicel above at base black. Umbilicately punctate. Abdomen compressed, the petiole twice longer than wide, segment 4 longest, 5 and 2 subequal; abdomen glabrous.

Basin of propodeum not large, with a single, foveate median channel through it. Pedicel twice longer than wide at apex, somewhat longer than funicle 1. An elongate black spot from base, mesad, caudal coxae.

From two females, Agricultural College, Michigan.

Type.—Cat. No. 20869, U.S.N.M. The specimens on tags.

DECATOMA AUTUMNALIS, new species.

Female.—Length, 1.45 mm.

Honey yellow, the wings hyaline, the head brownish, upper scrobes the ocellar area, upper occiput, cephalic margin mesad and median channel of propodeum, caudal tibiae dorsad except at apex, petiole meson of segment 2 of abdomen to middle and caudal margin of segments 2-4, dorsal aspect, black. Abdomen compressed, segment 5 longest. Antennae brown. Otherwise as in *michiganica*.

From one female, Mountain View, California (E. H. Ehrhorn), September.

Type.—Cat. No. 20870, U.S.N.M. The female on a tag.

DECATOMA COMPRESSA, new species.

Female.—Length, 2.45 mm.

Dull honey yellow, the substigmal blotch subobsolete (*Eudecatoma*), the following parts black: Scape dorsad narrowly, pedicel above (except at apex), ocellar area, upper occiput, face of pronotum, small triangle at center, cephalic margin of the scutum, narrowly connected with scutellum along the meson, cephalic margin and the median channel (save at apex) of propodeum, petiole, median line narrowly and acuminately of segment 2 of abdomen (but capitate at apex), same of 3 rather broadly (but with a pair of lateral projections from each side), of 4 uniformly to middle where there is a tooth from each side, thence triangularly to apex; and of 5 narrowly and acuminately to middle or more; a minute dot mesad, base of scutellum. An elongate spot mesad from base, caudal coxa. Abdomen ovate (lateral aspect), compressed strongly, segment 5 largest, the petiole twice longer than wide. Propodeum with its median channel widening much distad.

A female, Placer County, California.

Type.—Cat. No. 20871, U.S.N.M. The female minutien-mounted.

BRUCHOPHAGUS NOCTUA Girault.

Bruchophagus noctua GIRAULT, New Chalcid Flies, 1917, p. 1*a*.

Female.—Similar to *funebris* (Howard) but the funicle and club are bright yellow (the scape and pedicel black), the segments of the abdomen are longer, 4 is as long as 2 (not distinctly shorter). Otherwise the same. Types compared.

One female associated with *Languria mozardi*, Tempe, Arizona, August 1912. (V. L. Wildermuth.)

Type.—Cat. No. 20841, U.S.N.M. The female on a tag, a hind leg, antennae and a fore wing on a slide.

Family PTEROMALIDAE.

PARATRIGONOGASTRA STELLA, new species.[1]

Female.—Length, 1.50 mm.

Differs from the genotype in bearing on the propodeum a narrow but distinct "lateral carina" directly from the spiracle and with an equally narrow sulcus along its mesal side; parapsidal furrows are about half complete and segment 2 of the abdomen somewhat longer than 3 (in one female four segments after the long segment 4, the middle of these very transverse). The club is solid. Abdominal petiole about twice the length of the caudal coxae.

Like the genotype in coloration but the pedicel is concolorous with the scape yet darker above, the ring-joints yellow. Funicle 1 is about twice longer than wide, 6 quadrate, caudal coxae polished, shining dorsad. Propodeal spiracle slit-like, much longer than wide. Otherwise as in genotype with which it is closely allied. Clypeus with a distinct, rather stout tooth on each side of the meson, delicately striate (radiately).

Described from four females reared from *Agromyza* larva on bean roots, Los Baños, Luzon, Philippines (C. F. Baker), February, 1916.

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[1] This species is described in detail, but accredited to Girault, by Otanes y Quesales (Phil. Agric., vol. 7, 1918, p. 24) and the type should be selected from the specimens in Philippine College of Agriculture.—S. A. ROHWER.

Types.—Cat. No. 20872, U.S.N.M. Three females on tags, a head, fore wing and caudal legs on a slide.

TRIPOLYCYSTUS CRYPTOGNATHAE, new species.

Female—Length, 1.05 mm. Short, rather stout.

Dark metallic green, the wings hyaline, the venation dusky, the tibiae, tarsi, knees, scape, pedicel, ring-joints, and funicles 1-3 brownish yellow; femora washed with metallic, coxae concolorous. Differs from the genotype structurally in that the head is wider than the thorax but only a little so; the scutellum bears a distinct cross-carina before apex; the propodeum is conical, short at the small round, cephalic spiracle and with no spiracular sulcus; segment 2 of the abdomen is somewhat longer, occupying nearly half the surface. Clypeus projected somewhat as in *Tridymus* but its apical margin is concaved across the meson.

Head and thorax reticulate-punctate. Propodeum punctate. Caudal tibial spur long and slender. Pedicel a little longer than funicle 1 which is subquadrate. Flagellar joints with scored white marks running their length from near base (like flattened white setae). Club with no terminal nipple, no wider than the thorax. Ring-joints subequal, scape slender, long. Male the same but smaller.

From numerous pairs reared from pupa of *Cryptognatha nodiceps* Mskl., July, 1914 (F. W. Urich). Trinidad.

Types—Cat. No. 20873, U.S.N.M. One male, three females on tags and a slide bearing male and female head and female caudal legs.

Genus ARTHROLYTUS Thomson.

KEY TO NORTH AMERICAN SPECIES.

Based on the female types. The species *apatelae* (*pimplae*) Ashmead belongs rather to *Dibrachys;* it bears no spiracular sulcus. The genus *Arthrolytus* is characterized by the short postmarginal vein and insertion of the antennae (as regard *Pteromalus*).

Scape concolorous: apex of pedicel, funicle and club fulvous. Ring-joints unequal. Coxae, femora and tibiae (except at apex) metallic. Clypeus produced, sinuate at apex, barely striate. Spiracular sulcus deep, distinct, elbowed, nonfoveate. Antennae inserted slightly above the ventral ends of the eyes, a little below the middle of the face. Propodeum with a short neck, tricarinate, the spiracle elliptical. Scutellum simple. A distinct sulcus on dorso-lateral aspect of the propodeum. Postmarginal vein subequal to the stigmal. Segment 2 of abdomen short, entire. Pedicel shorter than funicle 1. Mandibles 4-dentate. ....*aeneoviridis* Girault.

The same exactly but more robust, the postmarginal vein slightly longer than the stigmal, the propodeal spiracle more linear and curved (reniform), the median carina of propodeum absent, the lateral carina distinct at the neck only, separated at base by a round fovea. Mandibles 3 and 4 dentate, the second tooth of the 4-dentate one, minute. Pedicel slightly longer than funicle 1. Legs entirely concolorous except tips of tibiae, knees, tarsi, and most of cephalic tibiae. ....*kansensis*, new species.

ARTHROLYTUS KANSENSIS Girault.

One female reared from an apple leaf-skeletonizer or from a lace-wing fly associated with the same. Riley County, Kansas, August (C. L. Marlatt).

Type—Cat. No. 20874 U.S.N.M., the female on a tag, a caudal leg on a slide.

DIBRACHYS METEORI Gahan.

This is a synonym of *Arthrolytus aeneoviridis* Girault. Types examined.

EURYDINOTA RUFIVENTRIS, new species.

Female—Length, 1.40 mm.

Like *Pteromalus* species but the clypeus hardly produced, its distal margin concave and less advanced than the obtuse projections on each side. Also the cheeks are distinctly shorter than the eyes. Abdominal petiole no longer than wide, reddish.

Dark metallic green, the wings hyaline, the venation dusky yellow, the legs except the concolorous lateral aspect of the coxae and the scape, pedicel and ring-joints, bright reddish yellow, the abdomen dark red except the base and apex and more narrowly, the lateral margins. Propodeum punctate, without a median carina nor spiracular sulci, the lateral carinae distinct. Like *Pteromalus archippi* Howard. Pedicel barely longer than wide, the funicle joints elongate, 1 nearly thrice longer than wide, 6 twice longer than wide. Postmarginal vein a little longer than the marginal, the long stigmal shortest of the three. Segment 2 of abdomen occupying over a third of the surface, twice the length of 3, the others transverse-linear, all segments entire; segments 2 and 3 glabrous. Neck of propodeum not abrupt. Mandibles spreading 4-dentate.

One female in the United States National Museum, Tifton, Georgia.

Type—Cat. No. 20875, U.S.N.M., the female on a tag, the head and caudal leg on a slide.

ENDOMYCHOBIUS FLAVIPES Ashmead.

Genotype.

This species bears a distinctly petiolate abdomen, the petiole subquadrate.

POLYCYSTUS GIBBUS, new species.

Female.—Length, 1.15 mm.

Dark metallic green, the wings hyaline, the scape, apex and under sides of pedicel, pale yellow, the venation, tibiae, and tarsi white. Clypeus and lower face radiate-striate, the head and thorax reticulated, the lines raised, the propodeum scaly, distinctly tricarinate, the spiracular sulcus distinct, foveate, a short neck present. Propodeal spiracle moderate in size, oval. Petiole quadrate. Abdomen ovate, depressed, keeled beneath, as long as the thorax, segment 2 occupying somewhat over a third of the surface, its caudal margin straight, 3-6 subequal, short, Scutellum much convexed, as seen from the side, protuberant. Axillae large, a little separated. Clypeal sutures obsolete, the distal margin of the clypeus concave. Cheeks nearly as long as the eyes. Pronotum transverse-linear, the cephalic margin acute. Antennae inserted a little below the middle of the face, 13-jointed with two equal ring-joints, the pedicel subequal to funicle 1 which is somewhat longer than wide, 2 quadrate, 6 wider than long. Marginal vein a little longer than the postmarginal, a third longer than the stigmal. Mandibles 4-dentate. Club no wider than the funicle. Head (cephalic aspect), somewhat wider than long, distinctly wider than the thorax.

Three females, Algonquin, Illinois. (W. A. Nason.) These are the types of "*Epipteromalus algonquinensis* Ashmead."

Types.—Cat. No. 12726, U.S.N.M., the specimens on tags, a head and caudal leg on a slide.

SPALANGIA MUSCIDARUM STOMOXYSIAE Girault.

Differs from *muscidarum muscidarum* in having in this variety the central part of the caudal scutum laterad of the meson impunctate and the male has funicle 7 subquadrate; the pronotum is glabrous mesad only from caudad to near the cephalic margin.

SPALANGIA MUSCIDARUM TEXENSIS, new variety.

Male.—The same as *muscidarum stomoxysiae* Girault except that the vertex is glabrous and also the caudal scutum nearly, the punctures there absent excepting three in a triangle on each side against the parapsides caudad and the median lines which are very faint. There are no punctures cephalad of the cross-line on the scutellum. The axillae are practically impunctate in both forms.

Described from two males labeled "Hunter No. 2970 B. 18, Dallas, Texas, December 24, 1912. Parasite of *Stomoxys calcitrans.*"

Type.—Cat. No. 20876, U.S.N.M. The above specimen on tags.

SPALANGIA RUGOSICOLLIS Ashmead.

Gainesville and Dallas, Texas, on *Stomoxys calcitrans* (W. D. Hunter.) This is the *Spalangia muscae* MS. name of authors. I have the original specimen of *muscae* from Washington, District of Columbia, *Spalangia muscidarum* Richardson. Dallas, Texas, with the variety. There may be a few isolated punctures in the disk of the scutellum cephalad of the cross-line of punctures.

SPALANGIA MUSCARUM, new species.

Female.—Length, 3.00 mm.

Like *rugosicollis* Ashmead but the distal three fourths of the scutum (instead of distal half) is rugoso-punctate; also the cross-line of punctures (the latter longer than wide) on the scutellum is distinctly farther cephalad from apex of the scutellum.

Described from one female (Accession No. 39589, Illinois State Laboratory of Natural History) reared from muscid puparia, Urbana, Illinois.

Type.—Cat. No. 20877, U.S.N.M., the specimen on a tag.

NASONIA BREVICORNIS Ashmead.

Often has the base of all femora concolorous.

Dallas, Texas.

Family MISCOGASTERIDAE.

TRIDYMUS CLAVICORNIS, new species.

Length, 1.70 mm.

Female.—Head (cephalic aspect) a little wider than long, the antennae inserted near the clypeus, strongly clavate and short, 12-jointed with two ring-joints, the first very short. Clypeus produced distinctly, highly convex, entire. Mandibles 4-dentate. Pronotum extremely short. Parapsidal furrows complete, deep. Scutellum with a distinct cross-suture before apex. Propodeum of nearly uniform length, distinct, moderately long, noncarinate, with five foveae between the round spiracles along cephalic margin. Abdomen conic-ovate, depressed above. Marginal vein a fourth longer than the submarginal which is somewhat longer than the long stigmal. Habitus of *Systasis*.

Dark metallic green, the wings hyaline, the legs except the last two pairs of coxae, the apex of the pedicel and the scape except along upper and lower margins, red. Flagellum fuscous. Funicle 5 over twice wider than long, a third wider than 1 and somewhat longer, 1 twice wider than long, much longer than the second ring-joint. Pedicel short but longer than any funicle joint. Scrobicular cavity obtuse, subglabrous, toward the sides with cross-striae. Club short ovate, without a nipple. Head and thorax densely scaly, the scutum with scattered thimble punctures (less distinct elsewhere).

From one female, Oxbow, Saskatchewan, Canada (F. Knab.).

Type.—Cat. No. 20829, U.S.N.M., the female on a tag, the head, hind legs, and a fore wing on a slide.

TRIDYMUS NIGRICLAVUS Girault.

Tridymus nigriclavus GIRAULT, Chalc. Nova Marilandensis, 1917, p. 2.

Female.—Length, 0.90 mm.

Dark metallic green, the wings hyaline, the knees slightly and the antennae (except the metallic scape, pedicel at immediate base above and the dusky club) light yellow. Funicle 5 a little the largest, quadrate, a little smaller than the pedicel; club at least three-fourths the length of the funicle. Antennae inserted near the clypeus, below the eyes. Mandibles 4-dentate. Head and thorax reticulated uniformly, nonpunctate (a single small puncture middle of scutellum, laterad). Propodeum distinct, noncarinate, the minute round spiracle cephalad. Foveae along the cephalic margin of the propodeum minute, confluent. Cross-suture of scutellum, faint, delicate. Postmarginal vein subequal to the stigmal. Clypeus subtruncate, advanced. Ring-joints short, subequal.

A female, open woods, May, Glenndale, Maryland.

Type.—Cat. No. 20878, U.S.N.M. The specimens on a tag, the head and caudal tibiae on a slide.

Genus PARASYNTOMOCERA Girault .

Parasyntomocera GIRAULT, Chalc. Nova Marilandensis, II, 1917, p. 2.

Belongs to the Tridymini. Antennae inserted a little below the middle of the face, a little above the ventral ends of the eyes, 12-jointed with one ring-joint, the club 4-jointed, the last joint distinct, nipple-like. Mandibles 4-dentate. Marginal cilia of fore wing distinct, short. Postmarginal vein distinctly longer than the short stigmal, the latter about a third the length of the marginal, the angle between stigmal and postmarginal at base somewhat thickened. Parapsidal furrows well defined, complete. Propodeum with a median carina only, the spiracle very minute, round cephalad (about its own diameter from the cephalic margin). Abdomen ovate, not compressed, slightly larger than the thorax. Scape not long. Resembles a *Systasis*. Strigil present.

PARASYNTOMOCERA HILLMEADIA Girault.

Parasyntomocera hillmeadia GIRAULT, Chalc. Nova Marilandensis, II, 1917, p. 2.

Genotype.

Female.—Dark metallic green, the wings hyaline, the venation dark; base and tips of tibiae and the tarsi (except the last joint) white. Apex of scape pallid. Body scaly reticulate, the propodeum subglabrous. Scape compressed. Pedicel a little longer than wide, longer than any funicle joint; ring-joint narrowest, short; funicle 1 next shortest and narrowest, thrice the size of the ring-joint, twice wider than long; 2 cupshaped, nearly twice longer than 1, 3–5 subequal, no longer than 2 but somewhat wider. Club large, two-thirds the length of the funicle. Scutellum long, with four minute bristles in a square on about distal half. A pair of foveae (the lateral one laterad) at cephalic margin of propodeum between meson and spiracle.

Described from one female captured by sweeping in the forest, Hillmead, Prince Georges County, Maryland, May, 1916.

Type.—Cat. No. 20879, U.S.N.M. The specimen on a tag, the head and one of each leg on a slide.

TEROBIA FLORA, new species.

Female.—Length, 1.85 mm.

Metallic coppery (the legs except the coxae laterad and the antennae reddish yellow) and like the species of *Habrocytus* but the antennae are inserted in the middle of the face, the scrobes distinct, the propodeum with a median carina and a cross-carina distad of middle (laterad to a point opposite a basal fovea which represents the lateral carina) and rugae from the cephalic and caudal margin toward the cross-carina out as far from the meson as the site of the lateral carina (absent) and this space otherwise glabrous, no propodeal neck. Head and thorax with pubescence as in *Catolaccus*, the parapsidal furrows complete. Head and thorax evenly finely punctate, the scutellum simple. Segment 2 of the abdomen occupying about a fifth of the surface, its caudal margin deeply concaved and at meson slit in a straight line to base or nearly (like a suture). Rest of abdomen scaly except distal margins broadly of each segment. Venation very pale. Clypeus striate, sharply incised at meson. Funicle 1 quadrate, half the length of the pedicel. The male has the coxa also yellow, the postmarginal vein only a little longer than the stigmal (as in the female), while the abdomen has a yellow stripe across it a little out from base and the marginal vein is short.

From one female, many males reared from fig, Cocoanut Grove, Florida, May 16, 1887.

Types.—Cat. No. 20880, U.S.N.M. One female, two males on tags and a slide with the appendages.

REPORT ON THE MAMMALIA COLLECTED BY MR. EDMUND HELLER DURING THE PERUVIAN EXPEDITION OF 1915 UNDER THE AUSPICES OF YALE UNIVERSITY AND THE NATIONAL GEOGRAPHIC SOCIETY.

By Oldfield Thomas,

Of the British Museum, London, England.

In 1912 and succeeding years an expedition was organized under the auspices of Yale University and the American National Geographic Society for the exploration of the deserted Inca city Machu Picchu, in the Cuzco region of Peru. To the 1915 staff of the expedition there was attached, as zoological collector, Mr. Edmund Heller, already so well known for his work in California and British East Africa, and it is on the result of his labors round Machu Picchu that the following paper is based. The collection has been placed in my hands by the authorities of the United States National Museum, at the kind suggestion of Mr. Gerrit S. Miller.[1] Thanks to my interest for many years in the mammal fauna of the region, its examination has been a very great pleasure to me, and I must express my acknowledgments to those to whom I owe the privilege of working it out.

An account of Machu Picchu and the highly successful expedition of 1912 for its discovery and exploration is given by Prof. Hiram

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[1] The Peruvian mammals were sent to Mr. Thomas in July and December, 1916, a time when the German submarine campaign made transportation sufficiently dangerous to warrant the retaining of a reserve series in Washington. With the assistance of Mr. N. Hollister I therefore divided the collection into two parts, one of which was to be forwarded to London and the other to be kept here. Our system in picking out the two sets was as follows: The various groups were divided into as many forms as appeared to be obviously or possibly distinct. Of each of these forms at least one specimen from every locality represented was placed in the first set. Moderately large series were divided about evenly between the two, but in the case of very extensive series the first set received not more than a representative lot of specimens. The material which forms the basis of this paper, though it numbers only 614 specimens out of a total of 892, is supposed to represent every mammal obtained by Mr. Heller. While it is unfortunate that it was necessary to divide the collection in this way, there is little probability that any forms not included in the first set were retained in the second. At the time of making the division we thought that the entire number represented by the material sent to London was slightly above 70; but only 65 were identified by Mr. Thomas. The lists of specimens here published are limited to the first set. The photographs reproduced in plates 14 and 15 show the skulls of all of the type specimens in the collection. They were made under my supervision after the material had been returned.—G. S. M., jr.

Proceedings U. S. National Museum, Vol. 58—No. 2333.

Bingham in the National Geographic Magazine,[1] with illustrations which show well the physical characters, the mighty mountains, and stupendous river valleys of the region where the collection was made. Machu Picchu is itself on the Urubamba River, some 45 miles northwest of Cuzco; and while it was being explored by the archaeologists of the party, Mr. Heller made collecting trips in different directions from it, so that the area over which the mammal collection was made extends from the Rio Comberciato, about 65 miles northwest of Machu Picchu to Pucara, close to Cuzco, all the places being in the drainage system of the Urubamba. A small number of specimens were also got at La Raya Pass, 100 miles southeast of Cuzco, on the watershed dividing the upper Urubamba from the Upper Pucara, which runs southeastward to Lake Titicaca. The exact positions of most of the localities are shown in Professor Bingham's map.

Considering its remoteness from civilized regions and the immense difficulties involved in making collections in such a place, it is certain that only a large and well-equipped expedition, such as that under the direction of Professor Bingham, could have provided an opportunity for a collector to have obtained anything like a complete series of the mammals of this area.

The collection consists of nearly a thousand specimens of all orders, but it is chiefly rich in Muridae, which Mr. Heller was extremely successful in capturing. In all it contains 65 species, of which I have found it necessary to describe 12 as new. Short diagnoses of all but one of these have been already published.[2] Of the novelties, by far the most interesting is a new Marsupial nearly related to *Coenolestes*, but sufficiently distinct to be regarded as a different genus. Members of the family were previously known from Colombia and Ecuador, so that the present is a considerable extension of the recent range of the group.

Within the area now dealt with, of which the crossing of 13° S. with 72° 30′ W. may be taken as the center, almost no collections of mammals have been made, a couple of small series sent to the British Museum by O. Garlepp in 1898 and 1903, and a few odd specimens, also in the British Museum, obtained by the Polish collector J. Kalinowski, appearing to be all that are recorded, although there may be a few others which I do not know of. In order to make the present list as complete as possible I have included in it the specimens of the Garlepp and Kalinowski collections, so that it contains all the species as yet known from the area. Near-by regions are, however, more richly represented, notably the district of Junin, where both

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[1] In the Wonderland of Peru, by Hiram Bingham, Nat. Geogr. Mag., vol. 24, p. 387, April, 1913.

[2] Smithsonian Miscel. Coll., vol. 68, No. 4, April 10, 1917.

Jelski and Kalinowski worked, and localities on the Rio Perené and Rio Inambari, where that fine collector, P. O. Simons, secured for us the first Peruvian series ever made in modern fashion. The last named also went to many other localities in Peru and Bolivia, and the majority of the species I have described were discovered by him. The only other modern Peruvian collection of importance is that recently made in the northwest by Messrs. Osgood and Anderson, and worked out by the former in 1913 and 1914. None of these collections, however, is anything like so complete a representative of its locality as the present one, which probably surpasses any other ever made in South America. Mr. Simons moved about too much to have worked any one locality as well; Messrs. Osgood and Anderson were merely passing through; while no one else of equally trained ability has entered the country.

The following is a list of faunal publications relating to the mammals of Peru, but of course much if not most of the literature is in the form of scattered observations on the different animals:

1844–1846. TSCHUDI, J. J. von. Fauna Peruana. Mammalia, pp. 1–262. In an effort to make it appear complete the accounts of the species in this work have been made so generalized as to deprive them of much of their value. This is notably the case with the geographical distributions, which even in the case of rare species are usually in quite general terms, without mention of particular localities.

1882. THOMAS, O. On a collection of Rodents from N. Peru. [Coll. J. Stolzmann.] Proc. Zool. Soc. London, 1882, p. 98. Tumbez, Cajamarca, etc.

1884. ———. On a collection of Muridae from Central Peru. [Coll. C. Jelski.] Proc. Zool. Soc. London, 1884, p. 447. Junin region.

1893. ——— On some mammals from Central Peru. [Coll. J. Kalinowski.] Proc. Zool. Soc. London, 1893, p. 333. Chanchamayo and neighborhood.

1897. ALLEN, J. A. On a small collection of Mammals from Peru. [Coll. O. T. Baron.] Bull. Amer. Mus. Nat. Hist., vol. 9, p. 115, 1897. Cajabamba, North Peru, and neighborhood.

1899. THOMAS, O. On some small mammals from the district of Cuzco, Peru. [Coll. O. Garlepp.] Ann. and Mag. Nat. Hist., ser. 7, vol. 3, p. 40, 1899.

1900. ALLEN, J. A. On Mammals collected in Southeastern Peru by Mr. H. H. Keays. Bull. Amer. Mus. Nat. Hist., vol. 13, p. 219, 1900. Inambari River.

1901. THOMAS, O. New Mammals from Peru and Bolivia, with a list of those recorded from the Inambari River. [Coll. P. O. Simons and others.] Ann. and Mag. Nat. Hist., ser. 7, vol. 7, p. 178, 1901.

1902. ————. On Mammals from Cochabamba, Bolivia, and the region north of that place. [Coll. P. O. Simons]. Ann. and Mag. Nat. Hist., ser. 7, vol. 9, p. 125, 1902. Many of these Bolivian species range into the Cuzco region.

1913. OSGOOD, W. H. New Peruvian Mammals. [Coll. W. H. Osgood and M. P. Anderson]. Field Mus. Nat. Hist. Publ., vol. 10, p. 95, 1913. Moyobamba, Cajamarca, etc.

1914. ————. Mammals of an Expedition across North Peru. Field Mus. Nat. Hist. Publ., vol. 10, p. 145, 1914. Moyobamba route.

1916. ————. Mammals of the Collins-Day South American Expedition. [Coll. G. K. Cherrie and R. H. Becker]. Field Mus. Nat. Hist. Publ., vol. 10,

p. 199, 1916. Mostly relating to Bolivia and the Amazons, but a few specimens recorded from the Peruvian plateau.

No specimens were obtained by Mr. Heller of the two rodents described by Mr. Eaton, the osteologist of the party, on skulls found by him in the Inca tombs of Machu Picchu during the 1912 expedition, *Abrocoma oblativa* and *Agouti thomasi;*[1] nor of *Lagostomus crassus* described by myself in 1910[2] on a skull found in the sand at Santa Ana by Mr. Kalinowski. The first and third of these animals are in all probability now completely extinct, judging by the fact that their relatives are no longer found in this faunal area, but only far south in Chile and Argentina. On the other hand, the second species, which is closely allied to living Andean forms, will perhaps be found still to exist in the neighborhood.

Finally, I must express by acknowledgements to Miss Winifred Davidson for the assistance she has given me in sorting, handling, and labeling the large series of specimens, an assistance which has materially eased the labor of preparing the present report.

1. ATELES ATER F. Cuvier.

Adult and young female, Nos. 194337 and 194339, Rio Comberciato (3,000 feet).

An adult specimen in the British Museum from Pachitea, determined by Doctor Eliot, is very similar to these.

2. ALOUATTA SENICULUS Linnaeus.

Three males and one female, Nos. 194349, 194352, 194353, and 194354, Rio Comberciato (2,000–3,000 feet).

3. CEBUS UNICOLOR CUSCINUS Thomas.

Male and female, Nos. 194356 and 194357, Uvini, Rio Cosireni (5,000 feet).

[Female, No. 98.11.6.1, B. M., Callanga, Cuzco. O. Garlepp. Type.]

These two specimens of the Cuzco *Cebus* agree in every detail with the type and confirm its distinction as a local form. I accept for the moment its relation with *unicolor*, as advocated by Doctor Elliot, who appeared doubtful of its validity, owing to its being based on a single example. Mr. Heller's specimens are therefore of interest as tending to resolve the doubt in the matter.

The greatest skull length of the male (not fully adult) is 95 mm.; of the female (old), 90 mm.

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[1] Mem. Conn. Acad., vol. 5, p. 87, 1916.

[2] Ann. and Mag. Nat. Hist., ser. 8, vol. 5, p. 246, 1910.

[CEBUS AZARAE PALLIDUS Gray.]

[Three males and one female, Nos. 97.10.3.4–7, B. M., Idma, Santa Ana, Cuzco. J. Kalinowski.]

The association with *azarae* is accepted on the a uthority of Doctor Elliot.[1] I had already referred the specimens to Gray's *pallidus*.

4. LAGOTHRIX THOMASI Elliot.

Young male, No. 194343, Rio Comberciato (2,000 feet).

[Female, No. 98.11.6.2, B. M., Callanga, Cuzco (5,000 feet). O. Garlepp. Type.]

No. 194343 of the present collection is quite young, so that it can not be determined with any certainty. It may perhaps be referable to the Cuzco form described by Doctor Elliot as *L. thomasi*.

5. SAIMIRI BOLIVIENSIS NIGRICEPS Thomas.

Three males and one female, Nos. 194344–7, Rio Comberciato (2,000 feet).

These specimens, and others recently received, confirm Doctor Elliot's observation that *nigriceps* may be distinguished from *boliviensis* by the deeper and more golden orange color of the forearms and feet, the tone in *boliviensis* being more yellowish. On the other hand, the intensity of the blackness of the cap, on which I primarily distinguished the subspecies, proves to be subject to considerable change with age, the older specimens having this a deeper black than the younger. Besides the type from Cosnipata, examples of *nigriceps* are in the British Museum collection from Marcapata (Kalinowski) and Tahua Manu River (Maj. H. S. Toppin).

6. LEONTOCEBUS PURILLUS Thomas.

Four specimens as follows:

Rio Cosireni, 3,000 feet, male and female, Nos. 194331, 194334.

Rio San Miguel, 4,500 feet, male and female, Nos. 194335–6.

These four specimens agree remarkably well with the type of *L. purillus*, which came from the Acre River, Upper Purus River, some 200 miles northeast of the present locality.

In the description, which was based on a single specimen that had been in confinement, emphasis was laid on the amount of ferruginous at the base of the tail, and on the buffy suffusion of the dorsal marbling; but both these characters prove to be variable on the evidence of Mr. Heller's specimens. On the other hand, the latter show one very well marked characteristic of the species which was not readily perceptible on the menagerie-soiled type—namely the white V-shaped frontal patch, extending the white of the muzzle backwards on each side over the eyes, a little suggesting the V-shaped eyebrows of the conventional pictures of Mephistopheles, done in white instead of black.

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[1] Primates, vol. 2, p. 108.

[MYOTIS NIGRICANS Wied.]

Six specimens in the British Museum, as follows:
Santa Ana, Nos. 97.10.3.20–21. J. Kalinowski.
Callanga, Cuzco, Nos. 98.11.6.3–5. O. Garlepp.
Marcapata, Cuzo, No. 3.2.9.1. O. Garlepp.

7. PEROPTERYX CANINA Wied.

One specimen in alcohol, Machu Picchu, No. 195118, is too much damaged for certain determination.

8. MOLOSSUS OBSCURUS Geoffroy.

Two specimens in alcohol, Santa Ana, Nos. 195173–4.

9. TADARIDA BRASILIENSIS Geoffroy.

Thirty-two specimens, as follows:
Machu Picchu, 6,000 feet, 3 (Nos. 194440–2).
Santa Ana, 3,500 feet, 29 (Nos. 194443–8. also 23 in alcohol not individually listed). Taken under tiles of roof.

10. GLOSSOPHAGA SORICINA Pallas.

Three specimens, as follows:
Santa Ana, 1 (No. 195125, in alcohol).
Idma, 6,000 feet, 2 (Nos. 194455 and 195126). No. 194455 was taken inside of a house. It contained one embryo.

11. ANOURA GEOFFROYI Gray.

Male, No. 195127, Ollantaytambo.
Represents Tschudi's *Choeronycteris peruana.*

12. PHYLLOSTOMUS HASTATUS Pallas.

Five specimens from Comberciato, 1,800 feet (Nos. 194460–4).

13. HEMIDERMA CASTANEUM H. Allen.

Seven specimens from Idma, 6,000 feet (Nos. 194436–9, also three in alcohol).

Quite similar to specimens obtained in Ecuador by G. Hammond, submitted to Mr. Gerrit Miller, by whom they were pronounced to be identical with *H. castaneum*, and compared with the common *H. perspicillatum.*

The species is distinguished both by its smaller skull and by the smaller size of the teeth, which are, however, remarkably variable, scarcely any two of the specimens agreeing in all details of the dentition.

No. 194438 is also anomalous in having its two upper posterior molars represented by a single one only, this being approximately of the shape of the normal last molar.

[STURNIRA LILIUM Geoffroy.]

[One specimen in the British Museum from Ocobamba, Cuzco. No. 98.11.6.6. O. Garlepp.]

14. DESMODUS ROTUNDUS Geoffroy.

Eleven specimens from Puquiura, 9,500 feet. (Nos. 194456–9; also seven in alcohol.)

15. FELIS PUMA Molina.

Male, No. 194310, Piscocucho, 8,700 feet. Condylobasal length of skull, 192 mm.

16. FELIS PARDALIS Linnaeus.

Male, No. 194311, Santa Ana.

17. PSEUDALOPEX CULPAEUS ANDINA Thomas.

Two specimens, as follows:
Paccaritampu, 1 (male, No. 194312).
Ocobamba Valley, 1 (male, No. 194313).

The Ocobamba specimen is a fine example in full winter pelage and agrees in all respects with the typical series. That from Paccaritampu is in poorer fur, and is rather smaller than usual. The skulls measure 159 and 148 mm. in condylobasal length, respectively.

18. POTOS FLAVUS Schreber.

Female, No. 194317, Uvini, Cosireni River (4,000 feet). Stomach contained figs.

This is the most southern locality from which the Kinkajou has been obtained, the nearest to it being Pozuzo, whence a pair is now in the British Museum. The specimen has a well-marked dorsal streak, and its skull measures 77.5 mm. in condylobasal length.

19. BASSARICYON ALLENI Thomas.

Adult and young female, Nos. 194315 and 194316, Rio Cosireni (3,000 feet). Stomach contained fruit and green vegetable pulp.

Except that the skull of the adult is slightly larger (condylobasal length, 79.5 mm.) these specimens agree absolutely with the Ecuadorian and Peruvian examples of *B. alleni* in the British Museum, having the same fulvous color, grayish face, and flattened frontal region of the skull.

The localities now represented for the species are Sarayacu and Gualaquiza, Ecuador (Buckley and Hammond), Pozuzo, Chanchamayo, and Rio Cosireni, Peru, (Egg, Schunke, and Heller).

A *Bassaricyon* from Munduapo, on the Orinoco, collected by J. K. Cherrie, appears to be referable to *B. medius* Thomas.

20. MUSTELA AUREOVENTRIS Gray.

Three specimens from Ollantaytambo, 9,000 feet (male No. 194326, female No. 194327 and an unsexed specimen, No. 194328).

[Male from Ocobamba, Cuzco, No. 98.11.6.1, B. M., O. Garlepp.]

Following Doctor Allen[1] I accept the identity of this dark-headed, yellow-bellied stoat with the species from Ecuador and Northern Peru, for which he uses Taczanowski's name *macrura.* But whether it is really distinct from the white or gray-bellied *M. agilis* of Tschudi appears to me doubtful in view of the considerable variability in color found in this group. An example from Lima, sent to England by the late Professor Nation, which I provisionally refer to Tschudi's species, has a practically white under surface and well-marked facial bands.

The name *aureoventris* is not invalidated by the earlier *auriventer* of Hodgson, as, apart from "one-letterist" differences, its first half comes from the adjective *aureus*, while Hodgson's name is based on the substantive *aurum*, so that not only the spellings but the derivations are different.

21. CONEPATUS AREQUIPAE Thomas.

Seven specimens, as follows:

Chospyoc, two males (Nos. 194321–2).

Urca, near Calca, female (No. 194324).

Machu Picchu, male (No. 194323).

Ocobamba Valley, two males (Nos. 194318–9) and one female (No. 194320).

These specimens confirm what I said in 1902 as to the difficulty of a proper determination of the members of *Conepatus*, and the probability that most of the forms would be found to grade into each other. Specimens from any given region have a generally similar facies, but almost every character varies individually, so that a diagnosis which shall cover every example is almost an impossibility. The present series all agree in having a long coarse coat and very broad white stripes, which are connected on the crown, the first character distinguishing them from *C. zorrino* and the second from *C. inca.* But in the reversal or nonreversal of the nape hairs, the separation or partial junction of the white stripes on the withers and the extension of the stripes down the back, there is considerable variation among them. In two out of the three Ocobamba Valley specimens the stripes even reach to the base of the tail, a character which I had hitherto believed to be one of those that distinguished the Chilean skunk, *C. chinga*, from all the forms of Peru and Bolivia.

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[1] Bull. Amer. Mus. Nat. Hist., vol. 35, p. 101, 1916.

With regard to nomenclature all may for the present bear the name *C. arequipae*, the type of which falls obviously into the same series, while *C. chorensis* (now that we know that the direction of the nape hairs is not a trustworthy character) and *C. porcinus* (if any mistake has been made as to the sexing of the type) may have to be united with the same animal. But the male skull of *C. chorensis* is a little smaller than that of *arequipae*.

The largest male skull of the present series, No. 194319, measures 83.2 mm. in condylobasal length.

22. LUTRA EMERITA Thomas (or COLOMBIANA Allen).

Female, No. 194325, Rio Comberciato (2,000 feet). Contained two small embryos.

Allowing for the sexual difference in the size of the skull, this specimen agrees remarkably well, especially in the shape of its nose pad, with the type of *L. emerita*, which may, however, prove to be synonymous with Allen's *L. colombiana*, a species I overlooked when writing my notes on South American otters in 1908.[1] The species would therefore seem to range all the way down the Andean chain on its eastern slope.

On the other hand, from quite near the present locality, the two examples of *L. incarum* Thomas, as explained in the original description, both show the form of the nose pad found in *L. platensis*, so that we have here otters with both types of nose pad occurring in the same locality. Whether the value of the character needs revision only much further material will show.

Another otter with the *emerita* type of nose pad is the South Chilian *L. provocax*, whose northward extension we do not yet know. There has been some doubt about the name of this animal, as it is certainly the species called *Lutra huidobria* by Gray and others, who based their use of the name on Molina's "*Castor huidobrius*." But I am not prepared to recognize as an otter a species described as having long rodent incisors and unpalmated forefeet, and think that in view of the insoluble mixture of local names, habits, and characters contained in Molina's description the name *Castor huidobrius* should be set aside as indeterminable.

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[1] After its return from London I submitted this otter to Dr. J. A. Allen for comparison with *Lutra colombiana*. He writes as follows (Dec. 5, 1919): "I have carefully compared the skin and skull of the otter from Peru with the type and two other specimens of my *Lutra colombiana*. There are no appreciable external differences, but the skull is slightly larger and more heavily built, with noticeably stouter teeth; also the pterygoid fossa is slightly longer and narrower. The Peruvian form should probably be considered as subspecifically separable from *colombiana*. The specimens I have been able to compare are all females and of about the same age as the Peruvian specimen."—G. S. M., jr.

23. TREMARCTOS ORNATUS F. Cuvier.

Female, No. 194309, Machu Picchu.

The skull of this bear corresponds closely with those from Cosnipata, Inambari, which I used for comparison in giving a name to the Ecuador *T. o. majori*. It is 191 mm. in condylobasal length by 128 mm. in zygomatic breadth. The two upper molars together measure 37 mm.

The skin presents a good example of the uselessness of the "spectacles" as a distinctive character, for it has a light supraorbital line on one side and not on the other.

24. SCIURUS CASTUS Thomas.

Female, No. 194486, Rio Comberciato (2,000 feet).

25. SCIURUS CUSCINUS Thomas.

Female, No. 194487, Rio Comberciato (2,000 feet).

Two females from San Fernando, Rio San Miguel, 4,000 feet (Nos. 194488–9).

[Two, Nos. 98.11.6.8–9., B. M. (No. 8 the type), from Ocobamba. O. Garlepp.]

[Three, Nos. 3.2.9.3–5., from Marcapata. O. Garlepp.]

26. MUS MUSCULUS Linnaeus.

Eleven specimens, as follows:

Huaracondo, Cuzco, 2 (Nos. 194502–194765).
Chospyoc, 10,000 feet, 2 (Nos. 194503, 194905).
Ollantaytambo, 9,400 feet, 5 (Nos. 194504–5, 194508–10).
Idma, 6,000 feet, 2 (Nos. 194513–4).

HOLOCHILUS INCARUM, new species.

A medium-sized species related to *H. sciureus*, but less buffy on flanks.

Size apparently about as in *H. sciureus*, but no adult female available for examination. General color above umber brown, not markedly more buffy on the flanks. Under surface slaty, washed with buffy, the hairs on a small patch on the throat white to their roots, but everywhere else broadly slaty at base, cinnamon buff terminally. Ears small, hairy, not darker than the general color of the head. Upper surface of hands and feet, buffy whitish. Tail about the length of the head and body, thinly haired, brown, rather lighter at base below.

Skull (pl. 14, fig. 1) not heavily ridged, but the only skull available is immature. Teeth comparatively small, as is usual in the Amazonian forms of *Holochilus*.

Dimensions of type, measured in the flesh by Mr. Erdis:

Head and body, 128; tail, 132; hindfoot (with claws), 36 (34 without claws on the dried skin). The hindfoot of No. 194917 measures 36 mm. (without claws), dried. Skull of type (immature); greatest length, 34; condylo-incisive length, 31; nasals, 14; palatilar length, 29; palatal foramina, 6.2; upper molar series, 7.2.

Type.—Immature female, from Santa Ana, U.S.N.M. No. 194915. Original No. 581. Collected December 22, 1914, by E. C. Erdis.

Specimens examined.—Male and two females from Santa Ana, 3,480 feet (Nos. 194917, 194915, 194919).

While a half-grown *Holochilus* from the Ucayali at the mouth of the Pachitea (alt. 440 feet), collected by Garlepp in 1903, is so exactly like equally immature specimens of *H. sciureus* that I see no reason to distinguish it, these specimens, from altitudes over 3,000 feet, are so uniformly without the marked wash of buffy on the flanks characteristic of that animal that they should apparently have a special name.

Unfortunately the material is somewhat imperfect, as neither 194917 nor 194919 has a skull, while the type is decidedly immature.

The Pachitea specimen, like those of the lower Amazon, has a well-marked buffy wash along the flanks, and it is not improbable that from Peru, at a comparatively low altitude, right down the Amazon to Para and Pernambuco, only one species of the genus is found, a distribution not impossible in so water-loving an animal. I confess now to considerable doubt as to whether *H. guianae* ought to have been separated from *H. sciureus*—a doubt which also applies to *H. amazonicus.*

The N. Peruvian *Holochilus* obtained by Mr. Osgood in 1912, also immature, is presumably the same as that from Pachitea.

27. NECTOMYS GARLEPPI Thomas.

Fifteen specimens, as follows:

Rio Comberciato, 2,100 feet, 1 (No. 194830).

Rio Cosireni, 3,000 feet, 1 (No. 194831).

Rio San Miguel, 4,500 feet, 3 (Nos. 194832, 194834–5).

Santa Ana, 6 skins (Nos. 194906–11) and 4 in alcohol (Nos. 195111–14).

The single adult specimen of this series, No. 194830, is somewhat intermediate between *N. garleppi* and the North Peruvian *N. apicalis* Peters. I provisionally apply to it the name which is geographically most pertinent.

28. ORYZOMYS KEAYSI Allen.

Thirteen specimens, as follows:

Machu Picchu, 6,000 feet, 11 (Nos. 194550, 194553, 194556, 194558–60, 194562–3, 195108–9).

Paltaybamba. 5,000 feet, 1 (No. 194883).

Santa Ana, 3,480 feet 1 (No. 195093).

29. ORYZOMYS NITIDUS Thomas.

Thirteen specimens as follows:
Machu Picchu, 6,000 feet, 4 (Nos. 194549, 194881–2, 194899).
Rio Cosireni, 3,000 feet, 1 (No. 194829).
Rio Comberciato, 5 (Nos. 194885–6, 194888–90).
Rio San Miguel, 4,500 feet, 2 (Nos. 194564–5).
Santa Ana, 3,500 feet, 1 (No. 194587).

30. ORYZOMYS STOLZMANNI Thomas.

Forty-three specimens, as follows:
Huaracondo, 11,000 feet, 1 (No. 194840).
Chospyoc, 10,000 feet, 5 (Nos. 194842–5, 194119).
Torontoy, 8,000–10,000 feet, 3 (Nos. 194842, 194847–8).
Machu Picchu, 6,000–8,000 feet, 9 (Nos. 194804–5, 194849–50, 194861, 194864, 194900–1, 195107).
Ollantaytambo, 13,000 feet, 3 (Nos. 194806, 194851–2).
Ocobamba Valley, Tocopoqueyu, 9,100 feet, 1 (No. 194853).
Paltaybamba, 5,000 feet, 1 (No. 194880).
Lucma, 9,000 feet, 2 (Nos. 194865, 194891).
Rio Cosireni, 3,000 feet, 1 (No. 194884).
San Fernando, 4,500 feet, 4 (Nos. 194854–5, 194892–3).
Idma, 6,000 feet, 5 (Nos. 194856, 194858–9, 195105–6).
Huadquiña, 5,000 feet, 1 (No. 194860).
La Raya Pass, 14,000 feet, 3 (Nos. 194783, 194903–4).
[Ocobamba and Callanga, Cuzco, 3 (B. M. Nos. 99.10.6.7 and 9, 98.11.6.23). O. Garlepp.]
[Marcapata, Cuzco, 1 (B. M. No. 13.2.3.12). O. Garlepp.]

31. ORYZOMYS (MICRORYZOMYS) AURILLUS Thomas.

1917. *Oryzomys* (*Microryzomys*) *aurillus* THOMAS, Smiths. Misc. Coll., vol. 68, No. 4, p. 1. April 10, 1917.

General color about as in *O. minutus*, much less strongly buffy than in *O. dryas;* ears longer than in either.

Fur soft, close, and woolly, as in other members of the subgenus; hairs of back about 8 mm. in length. General color above dull dark buffy ("Dresden brown"), rather clearer on sides. Under surface broadly washed with dull buffy ("tawny-olive"); the bases of the hairs dark slaty for three-fourths their length. Face rather grayer than back. Ears longer than in the other allied species, blackish, contrasting with the general color of the head. Rump generally of the color of the back, but occasionally more strongly fulvous. Hands and feet shining grayish, with more or less prominent dark metapodial patches. Tail long, finely haired, not penciled, brown, rather paler proximally below.

Skull (pl. 14, fig. 2) about as in *O. dryas*, rather more robust than in *O. minutus*.

Dimensions of the type: Head and body, 83; tail, 134; hind foot, 22.5; ear, 15.5. Skull, greatest length, 23.5; condylo-incisive length, 21; zygomatic breadth, 13; nasals, 8.2; interorbital breadth, 3.2; breadth of brain case, 11; zygomatic plate, 1.8; palatilar length, 9.7; palatal foramina, 4.2; upper molar, series, 3.

Type.—Adult female from Torontoy, U.S.N.M. No. 194795. Orig. No. 255. Collected May 15, 1915. "At timber line."

Sixteen specimens, as follows:

Torontoy, 9,500–14,000 feet, 8 (Nos. 194788, 194795, 194866, 194868–71, 195103).

Machu Picchu, 6,000–12,000 feet, 3 (Nos. 194872–3, 195104).

Ocobamba Valley, 9,100 feet, 5 (Nos. 194874–5, 194877–9).

After reading Mr. Osgood's remarks[1] about *O. dryas* and reexamining our material I came to the conclusion that this group of *Oryzomys* may very well have a special subgeneric name, and would suggest *Microryzomys*, with genotype *O. minutus*. The non-production forward to the zygomatic plate and the proportionally small molars would form the chief diagnostic characters, while, as Mr. Osgood says, the general appearance of the species shows something quite special and different from the other members of the large genus *Oryzomys*.

Within the group this Peruvian form differs from *O. dryas* by its duller color, more like that of the Pichincha *O. minutus*, and from both of those species by its longer ears.

I may record that an examination of the young type of *O. minutus* received with the Tomes collection in 1907 (B. M. 7.1.1.112) quite confirms the reference to that species of the Pichincha specimens sent us by Mr. Söderström in 1898. Young as it is, it shows the characters of *Microryzomys* in all respects.

32. NEACOMYS SPINOSUS Thomas.

Three specimens from San Miguel, 4,500 feet (Nos. 194838–9, 195116).

Osgood has drawn attention[2] to the variation from white to buffy in the belly coloration of this species, a variation repeated in a series from the Perené collection of Simons. The present specimens have white bellies, but the hairs in one are white throughout, while in the other they have slaty bases.

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[1] Field Mus. Nat. Hist. Publ., Zool., vol. 10, p. 158, 1914.

[2] Idem. p. 160, 1914.

33. PHYLLOTIS DARWINI POSTICALIS Thomas.

Twenty-five specimens, as follows:

Huaracondo, 11,000 feet, 9 (Nos. 194566–70, 194713–4, 194716, 194777).

Chospyoc, 10,000 feet, 7 (Nos. 194571–4, 194718, 194720, 195099).

Machu Picchu, 12,000 feet, 4 (Nos. 194575–6, 194721, 195091).

Ocobamba Valley, 9,100 feet, 2 (Nos. 194578–9).

Ollantaytambo, 13,000 feet, 2 (Nos. 194577–194722).

Puquiura, 1 (No. 195110).

As usual in this group the present series shows a good deal of variation both in size and color, and some of the specimens, notably those from Chospyoc, tend to resemble the paler subspecies *limatus*, which ranges from near Lima eastward to Arequipa, whence a considerable number were sent by Simons. The type locality of *posticalis* is Galera, on the heights of the Andes west of Oroya, department of Junin.

Owing to the manner in which the collector has pulled out the base of the tail, a tendency to buffy coloration on the hinder rump appears more prominent in these specimens than in Mr. Simons's skins, but, although not mentioned in the descriptions, it is present in a variable degree in most examples of the group.

34. HESPEROMYS FRIDA Thomas.

1917. *Hesperomys frida* THOMAS, Smiths. Misc. Coll., vol. 68, No. 4, p. 1. April 10, 1917.

A large, comparatively long-tailed species, with the supraorbital ridges little divergent. Size about as in the largest species of the restricted genus *Hesperomys*. Fur close and fine; hairs of back about 9 mm. in length. General color of specimens in unbleached pelage grayish drab, becoming more like "wood-brown" posteriorly; in bleached pelage the posterior back may be nearly cinnamon; sides lighter and more buffy, the edge of the belly color with a more or less marked buffy line. Under surface gray, the bases of the hairs slaty, their tips grayish white. Ears rather large for this genus, colored like head. Hands and feet pure white. Tail nearly equaling the head and body in length, inconspicuously grayish brown above, white on sides and below. Mammae 2–2=8.

Skull (pl. 14, fig. 3) shaped like that of a *Phyllotis* or of the smaller species of *Hesperomys*, the interorbital region flat, square edged, but without the broadly divergent ridges found in the other *Hesperomys* of this size. Zygomatic plate projected forward, its front edge vertical or very faintly concave; never distinctly undercut. Mesopterygoid fossa narrow.

Molars absolutely brachyodont, and thus different from the semihypsodont teeth of *Phyllotis*.

Dimensions of the type: Head and body, 102 mm.; tail, 91; hindfoot, 19; ear, 18. Skull, greatest length 26.7; condylo-incisive length, 24.3; zygomatic breadth, 14; nasals, 10.7; interorbital breadth, 3.8; breadth of braincase, 11.6; zygomatic plate, 3; palatilar length, 11.2; palatal foramina, 5.7; upper molar series, 3.9.

Type.—Adult female from Chospyoc, U.S.N.M. No. 194779. Original No. 96. Collected April 14, 1915.

Nineteen specimens, as follows:

Huaracondo, 11,000 feet, 6 (Nos. 194715, 194770, 194772, 194775–6).
Chospyoc, 10,000 feet, 8 (Nos. 194719, 194726, 194773, 194779–82).
Torontoy, 8,000 feet 1 (No. 194690).
Querafrata, 11,400 feet, 3 (Nos. 194710–11, 194723).
[Anta, Cuzco, 1, B. M. No. 3.2.9.10, O. Garlepp.]

This species differs strikingly from the other equal-sized species of restricted *Hesperomys* by the *Phyllotis*-like build of its interorbital region, the edges of which are symmetrically concave, and without the broadly divergent ridges found in *H. venustus* and its allies, and also in *Graomys.* From *Phyllotis* it is distinguished by its absolutely brachyodont molars, these being semihypsodont in that genus. When writing recently on this subject I erroneously spoke of the teeth of *Phyllotis* as brachyodont—a mistake induced by their less hypsodontism as compared with those of *Euneomys.* But they are very markedly more hypsodont than in *Hesperomys*, this being the real essential difference between the two genera.

35. HESPEROMYS CARILLUS MARCARUM Thomas.

1917. *Hesperomys carillus marcarum* THOMAS, Smiths. Misc. Coll., vol. 68, No. 4, p. 1. April 10, 1917.

Very similar to *H. carillus* of the Yungas region of Bolivia, but distinguished (1) by the general color being duller and grayer, with less buffy infusion; (2) by the upper side of the tail being, like the sides and below, quite white instead of more grayish buffy; and (3) by the palms and soles being considerably more hairy. In true *carillus* the soles, along their middle line at least, are naked almost to the heels, while in all the five available specimens of *marcarum*, taken at different seasons, the soles are hidden by the hairs to the level of the fifth or sixth sole pad.

Dimensions of the type, measured on skin: Head and body (stretched), 82; tail, 46; hindfoot, 17.7. Skull—nasals, 9; interorbital breadth, 3.9; palatilar length, 9.2; palatal foramina, 5; upper molar series, 3.7.

Type: Adult skin from Lauramarca, B. M. No. 3.2.9.8. Original No. 464. Collected June 25, 1899 by O. Garlepp. Presented by Oldfield Thomas.

Five specimens, as follows:

La Raya Pass, 14,000 feet, 2 (Nos. 194691–2).

[Lauramarca, Cuzco, 2 (Nos. 3.2.9. 8–9, B. M.), O. Garlepp.]

[Sucre, Cuzco, 1 (No. 3.2.9.11, B. M.), O. Garlepp.]

The specimens in the Heller collection, like most of those from La Raya Pass, are without skulls, but are clearly the same as the Cuzco examples collected by Garlepp, which I have long thought might be distinguishable from *Hesperomys carillus.* Undoubtedly the two forms are very similar, but the uniformly greater hairiness of the soles of the Cuzco series would seem to justify subspecific distinction.

36. EUNEOMYS (AULISCOMYS) PICTUS Thomas.

Forty-two specimens, as follows:

Huaracondo, 11,000 feet, 7 (Nos. 194515–6, 194518, 194520, 194526, 194717, 194777).

Ollantaytambo, Ocobamba Pass, 13,000 feet, 18 (Nos. 194527–9, 194538, 194706–9, 194774, 194977–9, 194980–6).

La Raya Pass, 14,000 feet, 16 (Nos. 194533–4, 194539, 194543, 194546, 194966–76.

This is a common and widely spread species in the highlands of Peru. In size and in the development of the ochraceous or tawny tints of the posterior body there is a very great difference between young adults and old adults; and on this account I confess to being somewhat doubtful of the difference from *E. pictus* of Osgood's "*Phyllotis* (*Auliscomys*) *decoloratus*"[1] from Puno, which is said to be distinguished by its smaller size and less strongly colored rump. The British Museum contains examples from two of the three localities mentioned by Osgood for *decoloratus*, and these are quite similar to normal *E. pictus* in every respect.

37. RHIPIDOMYS LEUCODACTYLUS Tschudi.

Ten specimens, as follows:

Machu Picchu, 6,000 feet, 1 (No. 194493).

Rio San Miguel, 4,500 feet, 4 (Nos. 194498–500, 195097).

Santa Ana, 3,000 feet, 1 (No. 194501).

[Ocobamba, Cuzco, 2, Nos. 98.11.6.19–20, B. M., O. Garlepp.]

[Marcapata, Cuzco, 2, Nos. 3.2.9.6–7, B. M., O. Garlepp.]

Quite agreeing with Garlepp's specimens from Ocobamba and Marcapata, Cuzco, which after seeing the type in Neuchatel, I have taken for *R. leucodactylus*, and equally distinct from the larger *R lucullus* of Vitoc.

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[1] Field Mus. Nat. Hist. Publ., vol. 10, p. 191, 1915.

38. THOMASOMYS AUREUS Tomes.

Five specimens, as follows:

Torontoy, 9,000–10,000 feet, 4 (Nos. 194817–20).

Ocobamba Valley, 9,100 feet, 1 (No. 194826).

The identity of these specimens with average examples of the somewhat variable *T. aureus* of Ecuador is remarkable. Compared with a number of specimens from the neighborhood of Pichincha they at first seem different by their more buffy belly; but not only do two examples among the Pichincha series have the same buffy belly, while two others are intermediate, but it is also of the same deep buffy in the type, which came from Gualaquiza.

The hind feet are more prominently particolored in the Torontoy set, less so in the specimen from Ocobamba, which closely matches some of the Pichincha series.

The majority of our Pichincha set are from about 7,000 feet, but one is from 12,000 feet, consequently a topotype of Allen's *T. a. altorum*, as to the validity of whose distinction from *T. aureus* I am most doubtful.

39. THOMASOMYS NOTATUS Thomas.

1917. *Thomasomys notatus* THOMAS, Smiths. Misc. Coll., vol. 68, No. 4, p. 2, April 10, 1917.

A medium-sized species with a dark dorsal stripe, broad feet, and well-marked metatarsal patches.

Size far smaller than in *T. aureus*, almost as in *cinereus*. Fur close, thick, rather woolly; hairs of back 6–7 mm. in length. General color above, in adults, ochraceous tawny, darker than the color so named in Ridgway; grayer on head, more tawny posteriorly; an ill-defined blackish streak down the middle of the back, from withers to rump, varying much in distinctness, but always perceptible. Undersurface soiled whitish, the hairs slaty basally, dull whitish terminally; lips and throat completely white, the hairs white to their bases. Hands above silvery whitish without darker markings on metacarpals; feet, on the other hand, only white along the edges and on the digits; the tarsus and metatarsus broadly and prominently brown. The feet themselves unusually broad for a *Thomasomys*, more as in *Rhipidomys*. Tail hairy, slightly penciled, uniformly dark brown above and below.

Skull (pl. 14, fig. 4) in general build like that of a miniature *T. aureus*, except that the zygomata are not so convergent forwards. Nasals narrow, their borders curiously sinuate, converging at their middle and then again diverging (or at least remaining strictly parallel) in their posterior third. Interorbital region narrow, its edges slightly raised to form low supraorbital ridges, similar to, though smaller than, those of *T. aureus;* the ridges scarcely extending on to the braincase—very different from the broadly divergent ridges of typical *Rhipidomys*. Zygomatic plate narrow, with vertical front edge, little projected forwards. Palatal foramina ending level with the front of m^1. Molars rather small in proportion to the size of the skull, conspicuously smaller than in the species of the *T. aureus* group.

Dimensions of the type: Head and body, 128; tail, 155; hindfoot, 27; ear, 18.5. Skull—greatest length, 33; condylo-incisive length, 30; zygomatic breadth, 17.4; nasals, 12; interorbital breadth, 4.2; breadth of braincase, 14; palatilar length, 13; palatal foramina, 7.1; post-foraminal palate, 4.6; upper molar series, 4.6.

Type.—Adule male from Torontoy, U.S.N.M. No. 194548; original number 173. Collected May 15, 1915.

Seven specimens, as follows:

Torontoy, 9,500 feet, 6 (Nos. 194547–8, 184894–7).

Machu Picchu, 8,000 feet, 1 (No. 194898).

From the point of view of systematic arrangement this well-marked species presents a problem of considerable difficulty; for with the general skull shape of the less typical species of the genus *Thomasomys*, it has comparatively broad feet, showing that it is a climbing animal; and it is just the broad feet which are supposed to characterize the members of *Rhipidomys*, while those of *Thomasomys*, more or less ground living, have long narrow feet. Moreover, the doubt as to its proper generic position is complicated by the fact that, while the more strongly marked species of *Rhipidomys* have broadly divergent supraorbital ridges, this can not be said of all of those which have been included in the genus.

40. THOMASOMYS GRACILIS Thomas.

1917. *Thomasomys gracilis* THOMAS, Smiths. Misc. Coll., vol. 68, No. 4, p. 2. April 10, 1917.

A very small species allied to *T. boeops*.

Size about the smallest of the genus. General appearance very much as in *T. boeops* or a miniature *T. notatus*. Color above dark grayish buffy or clay color (approximately "Dresden brown" of Ridgway), the posterior median area usually darker, the darkening not defined enough to be called a stripe. In some specimens the color varies toward cinnamon, but it is not clear whether this variation is seasonal or individual. Undersurface soiled grayish buffy, not sharply contrasted; the hairs slaty basally, dull pinkish buff terminally. Ears fairly large, blackish, contrasting with the general color of the head; a small patch behind their lower bases pale buffy. Hands and feet with brown metapodials and light digits. Tail long, well haired, blackish brown, scarcely lighter below; the extreme tip sometimes white.

Skull (pl. 14, fig. 5) quite of the general make of that of *T. bocops*, but conspicuously smaller. Interorbital region narrow, its edges just squared, but not rigged. Brain case smooth, rounded, little ridged. Palatal foramina well open, reaching back just past the anterior end of m¹. Bullae of normal size, much smaller than in *T. taczanowskii*.

Dimensions of the type: Head and body, 82; tail, 120; hind foot, 21.5; ear, 16. Skull—greatest length, 26.1; condylo-incisive length, 22.6; zygomatic breadth, 13.6; nasals, 9; interorbital breadth, 3.7; breadth of brain case, 12; palatilar length, 10.2; palatal foramina, 5.5; upper molar series, 3.6.

Type.—Adult male from Machu Picchu. U.S.N.M. No. 194816. Original number 321. Collected June 8, 1915.

Twenty-one specimens, as follows:

Torontoy, 10,700–14,000 feet, 7 (Nos. 194783–5, 194789–90, 194792, 194797).

Machu Picchu, 12,000–14,000 feet, 5 (Nos. 194798, 194800, 194802–3, 194816).

Ocobamba Valley, 9,100 feet, 2 (Nos. 194807–8).

Lucma, 10,000–11,400 feet, 7 (Nos. 194791, 194810–5).

This pretty little species is readily distinguished by its small size, buffy washed belly, and the strictly normal characters of its skull; the incisors not thrown forward as in *T. daphne*, nor the bullae enlarged as in *T. taczanowskii*.

41. THOMASOMYS DAPHNE Thomas.

1917. *Thomasomys daphne* THOMAS, Smiths. Misc. Coll., vol. 68, No. 4, p. 2. April 10, 1917.

A small, short-eared species, with its incisors thrown forward.

Size rather greater than in *T. gracilis*. General external appearance very much as in that animal, except that the color is duller and more drabby, and no dorsal darkening is perceptible. Color of back rather more buffy than "Saccardo's umber"; of undersurface slaty gray broadly washed with buffy, the line of demarcation not defined. Head grayer than back. Ears smaller than in *T. gracilis;* their color brown, not contrasting strongly with the head; buffy patch below outer base of ear present but not conspicuous. Hands and feet pale brown, with lighter digits; metapodial markings not strongly contrasted. Tail not heavily haired, brown above and below. One specimen with a white tip, the other not.

Skull (pl. 15, fig. 1) decidedly larger than that of *T. gracilis*, about equaling that of *bocops*. Interorbital region comparatively broad, its edges not ridged. Palatal foramina short, ending some way in front of m¹ and narrow, not widely open; their median septum broadened and flattened posteriorly. Bullae small.

Incisors differing from those of every other member of the genus by being distinctly thrown forward, their angle with the upper tooth row, measured as recently described,[1] 84° and 85° in the two specimens, while this angle comes out at about 70°–76° in *T. gracilis* and the other members of the genus examined. Molars as usual.

Dimensions of type.—Head and body, 92; tail, 133; hindfoot, 23.5; ear, 16. Skull—greatest length, 27.7; condylo-incisive length, 26.2; zygomatic breadth, 14.2; nasals, 8.5; interorbital breadth, 4.7; breadth of braincase, 13; palatilar length, 12.1; palatal foramina, 5.3; post foraminal palate, 5; upper molar series (worn), 4.2.

Type.—Old female from Ocobamba Valley, U.S.N.M. No. 194902. Original number 521. Collected July 29, 1915.

Two specimens from Ocobamba Valley, 9,100 feet (Nos. 194809 and 194902).

As already noticed, this species is remarkable for the unusually forward set of its incisors, which distinguishes it from every other member of the genus, and probably indicates some difference in its habits, which are perhaps of a more fossorial or at least more definitely terrestrial nature.

42. THOMASOMYS TACZANOWSKII Thomas.

One specimen, (No. 194876) from Ocobamba Valley.

This determination is of necessity somewhat provisional, and can only be settled when modern topotypes are available. The type has been skinned out of spirit, and is much discolored, while its ears are shrunk, as is always the case with specimens so treated. The skulls agree fairly closely, the size being about the same, the nasals similarly sinuate along their sides, as in *T. notatus*, and the bullae similarly larger than in the *T. gracilis* and the other small species to which this mouse has so strong a general resemblance.

43. AKODON SURDUS Thomas.

1917. *Akodon surdus* Thomas, Smiths. Misc. Coll., vol. 68, No. 4, p. 2. April 10, 1917.

A large, dark-colored species allied to *A. mollis*.

Size comparatively large. Build stout and heavy. Fur rather coarse. General color above dark olivaceous gray (near "sepia" Ridgway); under surface, soiled grayish, and hairs slaty basally, dull buffy or drab terminally; line of demarcation vague.

Ears of medium size, colored like head. Hands and feet grayish brown above, the flesh of the soles blackish. Tail fairly long, finely haired, dark brown, scarcely lighter below.

Skull (pl. 15, fig. 2) solidly built, its profile evenly convex above. Muzzle thick and heavy. Interorbital region broad, its edges squared.

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[1] Ann. and Mag. Nat. Hist., ser. 8, vol. 18, p. 302, footnote. 1916.

Zygomatic plate broad, projected forward, its front edge vertical. Palatal foramina widely open. Bullae of medium size.

Dimensions of the type.—Head and body, 110 mm.; tail, 80; hindfoot, 22.5; ear, 16. Skull—greatest length, 28; condylo-incisive length, 26.2; zygomatic breadth, 14.3; nasals, 10.4 by 3.8; interorbital breadth, 5; palatilar length, 12.2; palatal foramina, 6.6; upper molar series, 4.9.

Type.—Old male from Huadquina, U.S.N.M. No. 194663. Original No. 835. Collected October 28, 1915.

Eighteen specimens, as follows:

Idma, 6,000 feet, 6 (Nos. 194656–8, 195077, 195079–80).

Huadquina, 5,000 feet, 7 (Nos. 194661–3, 194694, 195087–9).

Paltaybamba, 5,000 feet, 1 (No. 195068).

Santa Ana, 4 (Nos. 195081–4).

This Akodon differs from its nearest ally, *A. mollis*, by its stouter build and smokier color, without tinge of buffy. The animal is of interest in connection with its strong external resemblance to the species here called *Microxus torques.* The two are found, respectively, at low (5,000–6,000 feet) and high (8,000–14,000 feet) altitudes and apparently represent the lowland and highland forms of northern Peru, distinguished by Osgood merely as subspecies of *A. mollis*—a closeness of relationship which, as explained below, under *Microxus torques*, I am not prepared to accept.

44. AKODON BOLIVIENSIS (Meyen).

Eighty-six specimens, as follows:

Huaracondo, 40 (Nos. 194664–5, 194669, 194671–2, 194731–2, 194734–5, 194739–40, 194998–195024, 195101–2).

Chospyoc, 10,000 feet, 3 (Nos. 194673, 194742–3).

Machu Picchu, 14,000 feet, 1 (No. 194744).

Ollantaytambo, 13,000 feet, 22 (Nos. 194674–5, 194746–59, 194951–3, 194959–61).

Ocobamba Valley, 9,100 feet, 9 (Nos. 194760–4, 194962–5).

Paltabamba, 5,000 feet, 3 (Nos. 194642, 194644–5).

Lucma, 9,000 feet, 1 (No. 194646).

Chiarapata, 11,200 feet, 2 (Nos. 194697–8).

Santa Ana, 3,500 feet, 2 (Nos. 194659–60).

La Raya Pass, 14,000 feet, 3 (Nos. 194695–6, no skulls, identification not positive, 195090 in alcohol).

The common small grass mouse of eastern Peru and Bolivia.

[AKODON (CHALCOMYS) AEROSUS BALIOLUS Osgood].

[One specimen in the British Museum from Callanga, Cuzco. O. Garlepp. No. 98.11.6.2.]

I record this under the name given by Mr. Osgood to the Inambari form of *A. aerosus*, but do not express any opinion as to its degree of difference from true *aerosus.*

Mr. Heller did not capture any representative of the subgenus *Chalcomys.*

45. BOLOMYS AMOENUS Thomas.

Two specimens from Huarocondo, 11,000 feet (Nos. 194724–5).

Type locality, Rio Colca; other specimens in the British Museum from Sangero, Department Puno, and San Anton, Titicaca.

46. CHROEOMYS INORNATUS Thomas.

1917. *Chroeomys inornatus* Thomas, Smiths. Misc. Coll., vol. 68, No. 4, p. 2. April 10, 1917.

Near *C. pulcherrimus*, but ears smaller and special markings reduced.

Size and general characters about as in *C. pulcherrimus.* Color most nearly as in *C. p. cruceri*,[1] to which there is a strong resemblance throughout. Body a duller olivaceous gray; crown and median dorsal area suffused with dark cinnamon buff, shoulders and sides more grayish, a coloration which gives a deceptive resemblance to the members of the genus *Abrothrix.* Underside gray, the bases of the hairs broadly slaty, their tips dull whitish gray; the resulting color conspicuously less whitish and less contrasted with the general tone of the back and sides. Nose spot rich ochraceous, and this color extends on the face up to the forehead and surrounds the eyes. Ears apparently shorter than in *C. pulcherrimus;* the color of the visible parts warm brown, not contrasted with the general color of the head. Post-auricular patches comparatively very inconspicuous; the tips only of the hairs on this part grayish white, and the extent of the patches reduced, surpassed behind by the ears themselves, and widely separated from the gray on the sides of the neck. Hands white; feet with the metatarsals pale cinnamon, the digits whitish. Claws apparently less elongated than in the allied species. Tail well haired, blackish along the middle line above, pale cinnamon on sides, whitish below.

Skull (pl. 15, fig. 3) essentially similar to that of *C. pulcherrimus*, but the bullae rather smaller. The type has its incisors as strongly colored as in *Akodon*, which is not usual in *Chroeomys*, but the second specimen is intermediate in this respect.

Dimensions of the type.—Head and body, 122; tail, 80; hindfoot, 24.5; ear, 16.[2] Skull—greatest length, 30; condylo-incisive length, 27.6; zygomatic breadth, 15.6; nasals, 12.4; interorbital breadth, 5; palatilar length, 12.5; palatal foranina, 6.9; upper molar series, 4.3.

Type.—Adult female from Ollantaytambo. U.S.N.M. No. 194685. Original No. 457. Collected July 20, 1915.

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[1] See Ann. and Mag. Nat. Hist., ser. 7, vol. 7, p. 186, 1901.

[2] Ear of other specimen measured as 18 mm.

Three specimens, all from Ollantaytambo (Nos. 194685–6, 195092).

This species is less typically *Chrocomys*-like in all the characters used to distinguish that genus from other members of the *Akodon* group; for the coloration is less abnormal, the claws are less elongated, the incisors are darker colored, and the bullae are smaller than in the hitherto known species of the genus. There is, however, no question that it is a *Chroeomys*, and that its nearest alliance is with *C. pulcherrimus cruceri*, with which it most nearly agrees in general color.

47. OXYMYCTERUS PARAMENSIS Thomas.

Three specimens, as follows:

Chospyoc, 10,000 feet, 1 (No. 194699).

Ollantaytambo, 13,000 feet, 2 (Nos. 194700, 194703).

Quite indistinguishable from the typical specimens of this species which came from Choquecamate, northwest Bolivia.

48. MICROXUS TORQUES Thomas.

1917. *Microxus torques* THOMAS, Smiths. Misc. Coll., vol. 68, No. 4, p. 3. April 10, 1917.

Like *M. mimus*, but the zygomatic plate not so strongly narrowed and slanting. Also superficially like *Akodon surdus*.

Size averaging slightly greater than in *M. mimus*. Fur close, soft, and woolly; hairs of back about 10 mm. in length. General color smoky or olivaceous gray, quite as in *M. mimus*, and also very similar to the color of *Akodon surdus*, although, owing to the softer texture of the hair, there is a difference in appearance. Under surface little lighter than upper, a vague darker streak often present in the sternal region. Ears rather short, colored like head. Hands and feet grayish brown above; soles flesh-colored, not blackish, as in *Akodon surdus*. Tail long, finely haired; brown above, scarcely lighter below.

Skull (pl. 15, fig. 4), as compared with that of *M. mimus*, very similar in most respects. Upper profile not perhaps quite so flattened in the frontal region, and therefore more approaching the even convexity found in *Akodon surdus*. Interorbital space broad, smooth, its edges scarcely squared. Zygomatic plate decidedly broader than in *M. mimus;* its front edge, although distinctly slanting, yet not so slanting as in *mimus*, and with a certain slight convexity in its upper third; this part therefore tending toward the condition found in *Akodon*. Palatal foramina well open, ending opposite the anterior third of first molar.

Dimensions of type.—Head and body, 102 mm.; tail, 94; hindfoot, 22.3; ear, 17. Skull—greatest length, 28; condylo-incisive length, 25; zygomatic breadth, 14.3; nasals, 10.2 by 3; interorbital breadth, 5; breadth of brain case, 12.5; zygomatic plate, 2 (1.5 in the type of

M. mimus); palatilar length, 11.8; palatal foramina, 6.5; upper molar series, 4.5.

Type.—Old male from Machu Picchu, U.S.N.M. No. 194607. Original No. 276. Collected May 28, 1915.

Fifty-eight specimens, as follows:

Torontoy, 9,500–14,000 feet, 39 (Nos. 194581–2, 194595, 194602–4, 195025–57).

Machu Picchu, 8,000–13,000 feet, 11 (Nos. 194605–8, 194610–11, 194619, 194676–7, 194693, 194745).

Ocobamba Valley, 9,100 feet, 3 (Nos. 194632–3, 194635).

Quirapata, 11,400 feet, 5 (Nos. 194647–9, 194680–1).

This species is distinguishable from *M. mimus* by its broader and less characteristically Microxine zygomatic plate, but is otherwise very similar to that animal. Osgood's *Akodon mollis orophilus* is said to be "more fulvous than *A. m. altorum*," which is anything but the case with the present animal; and his *A. m. orientalis* is a lowland form and much darker in color.

The proper treatment of this animal is a most difficult problem on account of its annectant characters. Originally two groups were known, *Akodon* with normal claws and vertical zygomatic plate, and *Oxymycterus* with elongated claws and slanting plate. Then certain species were discovered which had normal claws and slanting plate, and for these, after they had been referred either to *Akodon* or *Oxymycterus*, I formed the genus *Microxus*, with *M. mimus* as genotype. Next Mr. Osgood, getting a pair of forms, respectively lowland and highland, corresponding to the *Akodon surdus* and *Microxus torques* of the present paper, treated them merely as subspecies of a common form, *Akodon mollis*, a treatment which appears to me to give far too little value to the characters of the zygomatic plate.

But, on the other hand, I quite admit that while the zygomatic plate of the earlier described species was strongly and characteristically different from that of *Akodon*, that of *M. torques* (and I presume of *Akodon mollis orophilus* and *orientalis*) is more or less intermediate between the two. We have therefore to decide whether *Microxus* shall be amalgamated with *Akodon*, ignoring its peculiar zygomatic plate, or whether we shall recognize *Microxus* and put *torques*, *orophilus*, and *orientalis* into it, where they would form a group of species annectant with *Akodon*. Although I am by no means completely satisfied this latter course seems on the whole the most advisable for the present, and I have therefore treated Mr. Heller's animal as a member of the genus *Microxus*.

The above was written before the spirit specimens came into my hands. A study of these shows very strongly the essential difference between the two animals under discussion. The long head, especially the long muzzle, and the small eyes, give the *Microxus* quite a different aspect to that of the *Akodon* with its blunt snout and normal eyes, and I now feel no hesitation in considering them as belonging to different genera.

49. DASYPROCTA KALINOWSKII Thomas.

Adult female, No. 194485, Pumachaca, Urubamba Valley, 5,000 feet. Taken by E. C. Erdis.

The second known example of this striking species. The specimen is in more faded pelage than the type, but agrees with it in all essential respects, though the yellow of the belly is rather less strongly marked.

[DASYPROCTA VARIEGATA (Tschudi).]

[Three specimens in the British Museum from Callanga, Cuzco. Nos. 98.11.6.10–12. O. Garlepp.]

[LAGOSTOMUS CRASSUS Thomas.]

[A skull, the type, in the British Museum from Santa Ana, Cuzco. No. 97.10.3.16. J. Kalinowski.]

Like the *Abrocoma* described by Mr. Eaton, this Peruvian Vizcacha is no doubt now extinct. The skull was found buried in the sand.

50. VISCACCIA SATURATA Thomas.

Seven specimens as follows:

Ollantaytambo, 13,500–14,000 feet, 4 (Nos. 194466–9).

Between Puquiura and Huadquiña, 14,000 feet, 3 (Nos. 194479, 194481, 194483).

The Puquiura Pass specimens agree absolutely with the typical series of *V. saturata*, while those from Ollantaytambo are a little lighter, and tend to approach the palid form *V. arequipae*.

51. VISCACCIA AREQUIPAE Thomas.

One specimen, female, from La Raya Pass, 14,000 feet (No. 194478).

52. CAVIA TSCHUDII TSCHUDII Fitzinger.

Three immature females from La Raya Pass, 14,000 feet (Nos. 194490–2).

[Four specimens in the British Museum from Urubamba, Cuzco, 9,000 feet, Nos. 3.2.9.13–16. O. Garlepp.]

The La Raya Pass specimens have grayish bellies, while those from Urubamba are buffy below, but the former are all immature.

53. ODOCOILEUS PERUVIANUS Gray.

Six specimens as follows:

Ollantaytambo, 3 males and 1 female (Nos. 194300, 104304–5, 194299).

Chospyoc, Huaracondo, 1 male (No. 194301).

Paso Panticalla, 1 female (No. 194306).

54. MAZAMA AMERICANA WHITELYI Gray.

Female, Uvini, Rio Cosireni (No. 194308).

This is clearly Tschudi's *Cervus rufus*, but on geographical grounds it may be provisionally considered as subspecifically distinct from the Guianan and Brazilian form, to which that name, synonymous with *americanus*, properly belongs.

The type skull of Gray's *Coassus whitelyi*, however (B. M. No. 73. 6. 27. 2), coming quite from this region, appears to me to be referable to this larger Brocket, and not, as Lydekker has placed it, to the smaller *Mazama tschudii*, the *Cervus nemorivagus* of Tschudi.

Unfortunately that type skull is without skin and quite young, while Mr. Heller's example is old, and we have no Peruvian specimens connecting the two. An absolute identification must therefore await further material.

The hairs on the nape of this specimen are not reversed, and the skull measures 204 mm. in condylobasal length; tooth-series (worn) 63 mm. The anterior palatine foramina are no less than 37 mm. in length.

55. MAZAMA, species.

Imperfect skull of a male from Santa Ana, 3,480 feet (No. 194307). Collected by E. C. Erdis.

This skull (found on ranch of, and presented by, Alberto Duque) consists only of the frontals and brain case, without teeth, and is not certainly determinable. It seems, however, to indicate the presence in this region of a small *Mazama* of the *rufina-bricenii* group, as it appears too small to belong to *M. tschudii*, at least if that species is really as large as *M. simplicicornis*, of which it is said to be the Peruvian representative.

56. HIPPOCAMELUS ANTISIENSIS D'Orbigny.

Male and female from Ollantaytambo, 14,000 feet (Nos. 194298, 194303).

57. LAMA HUANACHUS CACSILENSIS Lönnberg.

Two males from La Raya Pass, 16,000–17,000 feet (Nos. 194292, 194294).

All the guanacos of the highlands of Peru and Bolivia may apparently be distinguished from those of Chile and Patagonia by their smaller size, as gauged by the skull length. Professor Lönnberg's name *cacsilensis*, from the plateau of Cacsile, Nunoa, quite near La Raya Pass, is available for them.

The broadly rounded choanal opening of the palate, so striking in Lönnberg's figure of the type of *cacsilensis*, proves to be a character quite untrustworthy. For while the guanaco usually has a narrow V-shaped opening, and the vicugna a broad rounded one, the British Museum contains specimens forming exceptions to the rule in both the species, and I therefore consider the type of *cacsilensis* to be another such exception.

In color there is less difference between *cacsilensis* and true *huanachus* than appears to be the case in the corresponding races of the vicugna.

The type locality of *huanachus* may be taken as Quillota, Chile, the only exact locality mentioned by Molina. In this region that author states that during the winter the guanacos come down from the mountains into the plains.

Sexual difference in these animals is well marked in the sizes of the incisors and canine teeth, so that skulls can be sexed at a glance.

58. LAMA VICUGNA MENSALIS Thomas.

1917. *Lama vicugna mensalis* THOMAS, Smiths. Misc. Coll., vol. 68, No. 4, p. 3. April 10, 1917.

Size slightly less than in true *vicugna* and teeth much smaller. Color more strongly fulvous.

The type locality of Molina's *Camelus vicugna* should apparently be taken as "the part of the Chilean Cordillera facing the Provinces of Coquimbo and Copiapo," and an example in the British Museum from Catamarca may provisionally be said to represent that animal; for the chain of the Andes could be no barrier to a vicugna, so that the forms of the eastern and western slopes would no doubt be the same.

From Peru and Bolivia quite a number of specimens are available, and as compared with the Catamarca specimen these all agree in having a slightly shorter skull, with shorter muzzle and nasal opening, and much smaller teeth, the combined length of the upper molars being usually well under 50 mm. (45 in the type, 44 and 45 in Lönnberg's two specimens), while the length in the Catamarca *vicugna* is 54 mm. The general color of the northern form is a strong cinnamon-tawny, the light underside white and sharply contrasted, while in the specimen of true *vicugna* the color is a colder and more grayish brown, somewhat like "avellaneous" of Ridgway. In this respect Mr. Heller's specimen is less characteristic than usual, duller and browner than in any others of the series of *mensalis* available. No doubt therefore considerable variation will be found to occur in the color where series of the forms are collected, and there will be some intergradation in the dimensions of the skull and teeth.

The northern form may therefore be considered as a subspecies of the southern and may have the above name applied to it.

The chief skull dimensions of the Catamarca specimen and of the type of *mensalis* are, respectively, as follows: Greatest length, 244 and 240; condylobasal length, 225, 224; greatest breadth, 122, 123; nasal opening, 92, 87; palate length, 116, 111; length of molars, 54, 45.

Type locality.—Incapirca, Zezioro, Junin, Peru; altitude, 17,700 feet. Other specimens in the British Museum from the Puna region, Peru (E. P. Ashmore), Cordillera, north of Titicaca, 17,000 feet (Maj. H. S. Toppin), Choquecamate, Bolivia (P. O. Simons), and "Bolivia" (T. Bridges).

Type.—Male adult. British Museum No. 97.10.3.18. Collected May 30, 1890, by J. Kalinowski.

Male and female from La Raya Pass, 16,000 feet (Nos. 194296–7).

59. OROLESTES INCA Thomas.

1917. *Orolestes inca* Thomas, Smiths. Misc. Coll., vol. 68, No. 4, p. 3. April 10, 1917.

Generic characters.—Like *Coenolestes*, but proportions of teeth different. Externally quite as in *Coenolestes.*

Skull (pl. 15, fig. 5) very like that of *Coenolestes;* zygomata broader and more flattened, especially anteriorly, where the height is some five or six times greater than the thickness. In *Coenolestes* the bar more nearly approaches the cylindrical, its thickness being from a half to three-quarters the height. Anteorbital vacuities present, as in *C. obscurus.* Opening of anteorbital foramina slightly further back, over the anterior third or middle of the first molariform tooth.[1] Palatal foramina and vacuities quite as in *Coenolestes.* Lower jaw without special peculiarities, though the two rami are perhaps less extensively in contact, and are in consequence less firmly united.

Teeth similar in number to those of *Coenolestes*, the formula, as I should now read it, being I. $\frac{4}{3}$; C. $\frac{1}{1}$; P. $\frac{4}{4}$; M. $\frac{3}{3} \times 2 = 46$.

Upper incisors as in *Coenolestes*, except that the fourth is narrower, more pointed, and in fact more like a premolar than the third, and stands a little way back from it, while in *Coenolestes* it is similar to and stands close behind the third.[2] Canines short, scarcely or not longer than incisors, double-rooted, premolariform in shape, quite unlike the long, single-rooted, normally-shaped canines of

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[1] M^1 of the Catalogue of Marsupials and of my original description of *Coenolestes*, p^4 as I now consider it should be reckoned.

[2] The figured skull of *Coenolestes*, as then explained, was abnormal in this respect.

Coenolestes. First premolar minute, perhaps one fifth to one tenth the bulk of the second, its tip not or barely as high as the cingular cusp of the canine; in *Coenolestes* the first and second premolars are subequal, sometimes one and sometimes the other slightly the larger. P^3 (the sector or pm^4 of the catalogue) of about the same size as in *Coenolestes*, its thickness transversely subequal anteriorly and posteriorly, while in *Coenolestes* it is thicker behind than in front, as is more usual in marsupials generally. Molariform teeth (p^4 and molars) as in *Coenolestes*, the minute m^3 perhaps averaging even smaller.

Lower teeth more like those of *Coenolestes* than is the case with the upper, but there is a corresponding, though slighter, reduction in the relative size of the posterior incisors, the canine and anterior premolars.

As a genus this animal is most readily distinguishable from *Coenolestes* by the shortening and the double-rooted condition of the upper canines, and the reduction in the relative size of p^1.

Specific characters.—Externally hardly distinguishable from *Coenolestes fuliginosus*, being of the same size and proportions, and of the same dull grayish-brown (near "clove-brown") color above, *C. obscurus* being more strongly brown in tone, though this difference may possibly be due to the fading of the specimens of the latter. Undersurface paler brown, the ends of the hairs drabby brown; in *C. fuliginosus* the ends of the belly hairs are dull grayish white. Ears with a narrow rim of whitish or glossy hairs, this whitish rim not perceptible in the specimens of *Coenolestes*. Hands and feet brown on metapodials, lighter on digits. Tail averaging about the length of the head and body, thinly haired, either uniformly dull brown or slightly mottled with dull whitish.

Skull and teeth as described above.

Dimensions of four specimens: Male 194401 (type), head and body, 120; tail, 108; hindfoot, 22; ear, 15. Male 194381, head and body, 122; tail, 113; hindfoot, 22.5; ear, 15. Female 194397, head and body, 106; tail, 104; hindfoot, 21.5; ear, 15. Female 194398, head and body, 105; tail, 125; hindfoot, 22.5; ear, 15.

Skulls of male and female, the first the type: Greatest length, 33, 31.4; condylobasal length, 32.5, 31; zygomatic breadth, 14.8, 14.8; nasal length, 17.5, 15.6; intertemporal breadth, 7.8, 7.8; breadth of brain case, 12.4, 12; palatal length, 19, 18; palatal foramina, 7.3, 7; upper tooth series, 18.3, 17.5; combined length of three anterior molariform teeth (p^4 to m^2), 5.4, 5.3; lower tooth series, 17. 16.6; length of i_1, 5.2, 4.9; three anterior lower molariform teeth, 5.8, 5.8.

Type.—Adult male from Torontoy. U.S.N.M., No. 194401. Original No. 248. Collected May 14, 1915.

Seventeen specimens as follows:

Torontoy, 9,500–14,000 feet, 7 (Nos. 194381–2, 194386, 194391, 194397–8, 194401).

Machu Picchu, 12,000–13,000 feet, 6 (Nos. 194415–16, 194418, 194420–1, 194428).

Ocobamba Valley, 9,100 feet, 4 (Nos. 194429, 194431–2, 194434).

This animal is the prize of the collection and really represents a most interesting discovery. Specimens of the family *Coenolestidae* are still exceedingly rare in collections, and even if the present series had been referable to the original genus *Coenolestes*, they would have been of great value. And this is of course still more the case now that they prove to represent a second genus of this archaic group.

The recent specimens of the *Coenolestidae* as yet known are as follows:

The type of *Hyracodon fuliginosus* Tomes, Ecuador, B. M. No. 7.1.1.191. A young specimen preserved in spirit. This historic example, described in 1863, was not accessible when I wrote my paper on *Coenolestes* in 1895.

Two skins (one skull only) from Gualea, Ecuador, collected in 1914 and presented by W. Goodfellow, Esq., B. M. Nos. 15.11.25.5–6. These undoubtedly represent true *fuliginosus*, and are of particular value, owing to the type's age and condition rendering it useless for any close comparison.

Four specimens from La Selva Estate, Bogota. Collected in 1895 by an Indian in the employ of Mr. G. D. Child. B. M. Nos. 96.1.7.1–3, and American Museum of Natural History No. 10559, the latter being the basis of Miss Dederer's paper on the genus (1909). The original series of *C. obscurus*, of which B. M. No. 96.1.7.1 is the type.

Eleven specimens of *C. obscurus* from the Paramo de Tama, head of the Tachira River, Colombia and Venezuela. Collected by W. H. Osgood in February and March, 1911, and referred to by him, with the promise of a subsequent paper on the subject, in the account of his expedition.[1] Now in the Field Museum of Natural History, Chicago.

Finally the series of *Orolestes inca* from Peru.

When describing *Coenolestes obscurus* I distinguished it from *C. fuliginosus* mainly by size, but as Tomes's type proved to be young, there was until recently nothing to show whether the two species were or were not distinct. Now, however, I am able to state, on the evidence afforded by Mr. Goodfellow's specimens, that *C. obscurus* has rather larger teeth than *C. fuliginosus* (first three molariform teeth 6.2 instead of 5.5 or less); that it is grayer and less brown in color above, exactly as in *Orolestes inca*, washed with grayish white below, instead of brown; and, finally, that it is distinguished from both the other members of the family by the anteorbital vacuities being filled in with bone. In the young specimen, the type, there is still a narrow unossified cleft between the outer corners of the nasals and the maxillae, but in the adult specimen even this is almost completely closed up.

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[1] Field Mus. Nat. Hist., Publ., vol. 10, p. 38, 1912.

The very great sexual difference in size between our two adult specispecimens of *C. obscurus* is noteworthy (male skull 36.3, female 32.5), this being considerably greater than in *Orolestes*, but whether it is constant I do not know, nor have I material to state what is the corresponding difference in *C. fuliginosus*

In accordance with the latest conclusions of the paleontologists who have written on the subject, I am now quite prepared to admit that *Coenolestes* and its allies should be reckoned as more related to the Polyprotodonts than to the Diprotodonts.

60. DIDELPHIS MARSUPIALIS ETENSIS Allen.

A young male from Santa Ana, 3,000 feet (No. 194373).

61. DIDELPHIS PARAGUAYENSIS PERNIGRA Allen.

Seven specimens as follows:

Chospyoc, 10,000 feet, 2 (Nos. 194358–9).
Torontoy, 2 (Nos. 194360–1).
Machu Picchu, 3 (Nos. 194367–8, 194370).

While most of the specimens hitherto obtained in southern and southeastern Peru have been in the black phase, these specimens, curiously enough, are with one exception in the gray phase, with the dorsal piles white. They thus exactly resemble average specimens of *D. p. andina*, the opossum of Ecuador and North Peru.

62. METACHIRUS NUDICAUDATUS TSCHUDII Allen.

Adult female, Rio Cosireni, 3,000 feet (No. 194376).

63. PHILANDER LANIGER ORNATUS Tschudi.

Adult female, Rio Comberciato, 2,000 feet (No. 194375).

With well-marked postauricular gray lines, these, like the median patch on the foreback, appearing to be individually variable. Of three specimens from the Upper Maranon, one has them and two have not.

[MARMOSA RAPPOSA Thomas.]

[A female and four young in the British Museum from Vilcanota River, Cuzco. Nos. 98.11.16.13–17, the adult the type. O. Garlepp.]

64. MARMOSA IMPAVIDA Tschudi.

Adult male, Torontoy, 8,000 feet (No. 194378).

The examination of this specimen, with its really white undersurface, has made me revise the determination of our small Peruvian *Marmosae*. This character had not previously been observed in any Peruvian species, but now Mr. Heller's specimen corresponds so closely with Tschudi's description, both in this and other respects, that it should certainly be regarded as *impavida*. In consequence, the specimens from Chanchamayo and Marcapata that I had previously called *impavida*, as also those from Yurimaguas, so named by Mr. Osgood with my connivance, need redetermination. On the whole it appears to me that they may suitably be called *M. noctivaga* Tschudi, a form which I had wrongly assigned to *M. cinerea*, but whose type I have since seen in Neuchatel and have taken a measurement of its teeth, which closely correspond with those of the Chanchamayo examples.

The skull and teeth of *M. impavida* are markedly smaller than those of *noctivaga*, agreeing in fact very nearly with those of *M. quichua*, the latter being distinguishable mainly by its cream-buffy throat and chest and broadly slate-based belly hairs with buffy fawn tips.

Even on the white undersurface of Mr. Heller's specimen there is an unsymmetrical area on the side of the chest where the hairs are slaty gray at base, but this is obviously an individual variation.

[MARMOSA QUICHUA Thomas.]

[A specimen in the British Museum from Ocobamba, Cuzco. No. 98.11.6.18. Type. Collected by O. Garlepp.]

65. PERAMYS PERUVIANUS Osgood.

Two males from Ocobamba Valley, 9,100 feet (Nos. 194379–80).

These two specimens, caught in the same place on successive days, differ remarkably in color, but agree in so many essential characters that they must, I think, belong to the same species. No. 194379 is grayish above, anteriorily, while 194380 is more uniformly brown, and very like *P. adustus;* but the former is very old, with worn teeth, and the grayness is probably due to senility. Then also 194379 has the buffy abdominal patches described in the type, while, like *P. adustus*, 194380 is without them. This again, however, may be an age characteristic—a point which further material can alone elucidate.

The British Museum possesses no *Peramys* from Peru, the two deteriorated examples described by Osgood being the only Peruvian examples of the genus on record.

The skulls of both the present specimens are unfortunately broken to pieces, and it is only possible just to compare the size and wear of the molar teeth.

EXPLANATION OF PLATES.

PLATE 14.

(All figures approximately natural size.)

FIG. 1. Skull of *Holochilus incarum* Thomas. No. 194915, U.S.N.M. Type. See p. 226.

2. Skull of *Oryzomys* (*Microryzomys*) *aurillus* Thomas. No. 194796, U.S.N.M. Type. See p. 228.

3 Skull of *Hesperomys frida* Thomas. No. 194779, U.S.N.M. Type. See p. 230.

4 Skull of *Thomasomys notatus* Thomas. No. 194548, U.S.N.M. Type. See p. 233.

5 Skull of *Thomasomys gracilis* Thomas No. 194816, U.S.N.M. Type. See p. 234.

PLATE 15.

(All figures approximately natural size.)

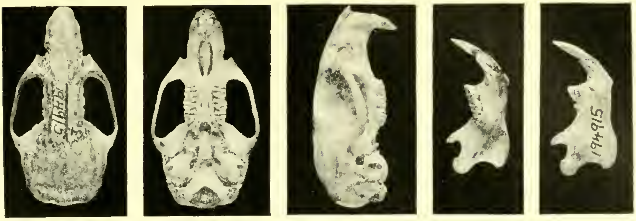
FIG. 1. Skull of *Thomasomys daphne* Thomas. No. 194902, U.S.N.M. Type. See p. 235.

2. Skull of *Akodon surdus* Thomas. No. 194663, U.S.N.M. Type. See p. 236.

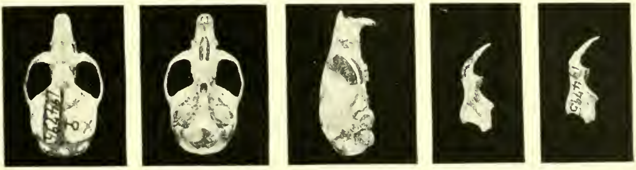
3. Skull of *Chroeomys inornatus* Thomas. No. 194685, U.S.N.M. Type. See p. 238.

4. Skull of *Microxus torques* Thomas. No. 194607, U.S.N.M. Type. See p. 239.

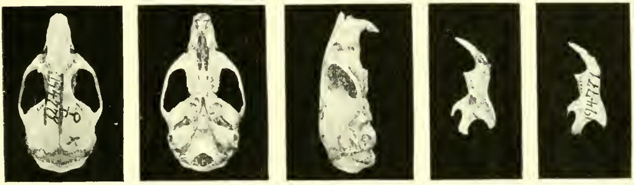
5. Skull of *Orolestes inca* Thomas. No. 194401, U.S.N.M. Type. See p. 244.



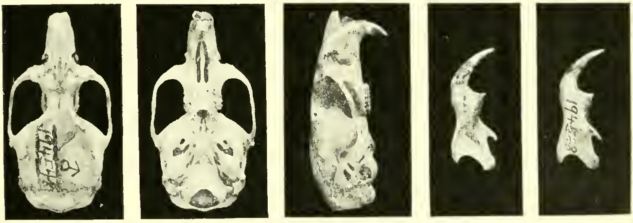
1. HOLOCHILUS INCARUM.



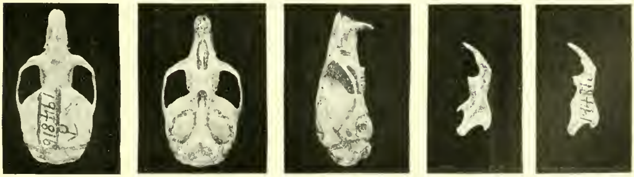
2. ORYZOMYS AURILLUS.



3. HESPEROMYS FRIDA.



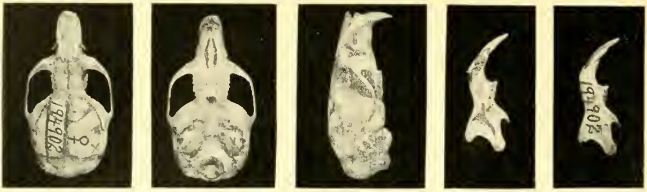
4. THOMASOMYS NOTATUS.



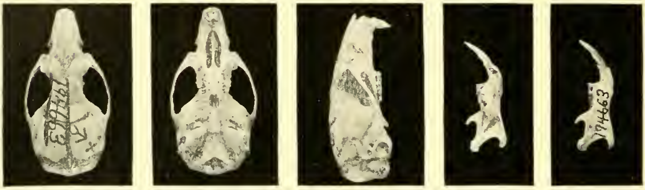
5. THOMASOMYS GRACILIS.

SKULLS OF PERUVIAN MAMMALS.

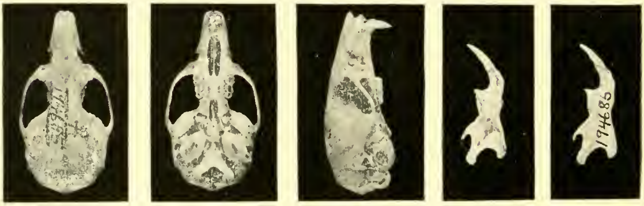
FOR EXPLANATION OF PLATE SEE PAGE 249.



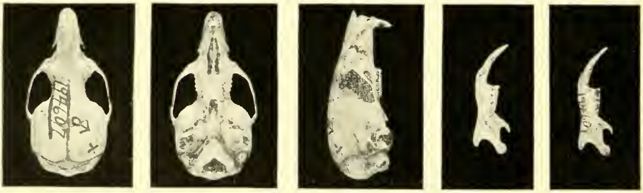
1. THOMASOMYS DAPHNE.



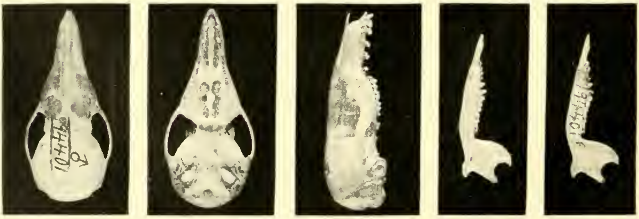
2. AKODON SURDUS.



3. CHROEOMYS INORNATUS.



4. MICROXUS TORQUES.



5. OROLESTES INCA.

SKULLS OF PERUVIAN MAMMALS.

NORTH AMERICAN ICHNEUMON-FLIES, NEW AND DESCRIBED, WITH TAXONOMIC AND NOMENCLATORIAL NOTES.

By R. A. Cushman,

Of the Bureau of Entomology, United States Department of Agriculture.

This paper includes corrections to Viereck's "Type species of the genera of Ichneumon-flies," published as Bulletin 83 of the United States National Museum, and extensive additions to my own revision of the tribe Cremastini[1], together with the descriptions of 1 new genus, 1 new subgenus, and 23 new species of Ichneumonidae, and 3 new species of Braconidae.

Family ICHNEUMONIDAE.

Subfamily JOPPINAE.

Genus PHAEOGENES Wesmael.

PHAEOGENES ARCTICUS, new species.

At once distinct from any described North American species by the insensely black immaculate body and antennae and bright reddish testaceous legs.

Female.—Length, 6 mm.; antennae, 3.5 mm.

Head finely punctate, temples sparsely, face more densely so, behind eyes nearly as broad as eyes; temples strongly convex; occiput deeply concave; face medially elevated; clypeus transverse, nearly twice as broad as long, apex rounded, sparsely punctate, margin finely foveolate, deeply separated from face, the foveae large and deep; cheeks slightly buccate; malar space nearly as long as basal width of mandible; antennae rather short and stout, scape only weakly oblique at apex, about as long as first joint of flagellum, the latter about twice as long as thick; mandibles narrowed apically, lower tooth much shorter than upper; pronotum, mesoscutum, and scutellum polished, with well-separated punctures coarsest in middle of mesoscutum; notauli briefly impressed, mesopleurum and metapleurum punctate-striate, the former polished in dorso-posterior angle; sternauli well defined for about half the length of the mesopleurum; propodeum with carinae strong, upper hind angles angulate, areola hexagonal, about as wide as long; petiolar area comprising about half dorsal surface of propodeum, slightly concave, transversely striate, propodeum otherwise coriaceous; legs stout; hind coxae with a small, acute tooth beneath at apex; wings reaching to apex of abdomen; areolet nearly equilaterally pentagonal; second intercubitus distinct though largely bullated; nervellus perpendicular; abdomen narrow fusiform; petiole strongly flattened; postpetiole longitudinally rugulose; second tergite with gastrocoeli shallow, distant from base, this and following tergites coriaceous, subopaque, apical tergite polished; lunulae distinct on second and third tergites, circular; ovipositor extending slightly beyond apex.

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[1] Proc. U. S. Nat. Mus., vol. 53, 1917, pp. 503–551.

Black; antennae slightly brownish; tegulae and mandibles piceous; legs bright rufo-testaceous, apices of hind femur and tibia and their tarsi largely fuscous; wings slightly blackish hyaline, venation blackish, wing base white.

Male.—Length, 7 mm.; antennae, 6 mm.

Except for the usual sexual differences of more slender abdomen, longer and more slender antennae, and lack of the coxal tooth, differs in having the scape brownish beneath, and the clypeus, mandibles, a larger or smaller spot on each side of face, and the tegulae basally white.

Host.—*Peronea*, species, on spruce and hemlock.

Type locality.—Tongas National Forest, Alaska.

Type.—Cat. No. 22849, U.S.N.M.

Described from three females and five males reared at Washington, District of Columbia, under Hopkins U. S. No. 13448, from material collected by A. J. Jaenicke.

Paratype *b*, female, is slightly larger than the type, while *c*, male, bears the same relation to the allotype. Paratype *c* also has the facial spots much larger than those of the allotype.

Genus ISCHNOPSIDEA Viereck.

Ischnus Authors, not Gravenhorst.

Only one North American species has been described in this genus—namely, *Ischnus americanus* Ashmead—but it does not belong here but to *Atractodes*. Nor do any species of the genus appear to have been described under other generic names. Viereck [1] synonymized *Posocentrus* Provancher with *Ischnus* presumably on the strength of a misdetermination by Ashmead of the genotype, *Posocentrus huarti* Provancher, in the United States National Museum. Under this name are two females, one labeled "Sh. 30.9.96" and the number 665, and the other "Sh. 7, 10, 95" and numbered apparently 358. These represent a very distinct species, which I do not describe for lack of information as to the source of the specimens. A male of apparently the same species is from Cornwall, Idaho, collected August 1, 1898, by C. V. Piper.

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[1] Bull. 83, U. S. Nat. Mus., 1914, p. 122.

ISCHNOPSIDEA COLORADENSIS, new species.

In Berthoumieu's[1] key to the European species runs to *nigricollis* (Wesmael), but differs in having the abdomen entirely black. From the closely allied *truncator* (Fabricius) it differs in having the entire thorax, even the scutellum, black; the third tergite transverse; and the antennae white annulate.

Female.—Length, 8 mm.; antennae, 5 mm.

Head large, seen from above nearly as broad behind eyes as at eyes; temples weakly convex, extending nearly straight backward, and nearly as wide as short diameter of eye; eyes rather small, broadly oval; malar space nearly half as long as eye; eyes slightly divergent below; vertex slightly, face distinctly, broader than height of eye; clypeus distinctly truncate at apex, with the labrum slightly protruding; cheeks broad, buccate; head strongly punctate, throughout, face densely so; thorax strongly punctate, mesoscutum and scutellum rather sparsely so, notauli distinct to about middle of mesoscutum, scutellum margined to middle; propodeum densely punctate-rugulose above, transversely rugose behind, areola pentagonal, only slightly narrower at apex than at costulae, petiolar area not distinctly defined laterally; petiole subpolished, postpetiole opaque laterally, subpolished and weakly striate medially; other tergites opaque punctate; gastrocoeli nearly meeting in middle.

Black; antennae with apices of joints pale and a white annulus on flagellar joints 11–12; mandibles, tegulae, wing bases, and small humeral spot white; legs testaceous, hind tibia and tarsus slightly infuscate, middle and hind tibiae narrowly white at base.

Type locality.—Colorado.

Type.—Cat. No. 22850, U.S.N.M.

Described from two females from the C. F. Baker collection.

The paratype is about a millimeter shorter than the type, with the abdomen slightly reddish, but is otherwise much like the type.

Subfamily CRYPTINAE.

Genus ATRACTODES Gravenhorst.

(ISCHNUS) ATRACTODES AMERICANUS (Ashmead).

Genus SPILOCRYPTUS Thomson.

SPILOCRYPTUS PROPODEUM, new species.

Male.—Length, 5.5 mm.; antennae, 5.5 mm.

Differs from the male of *polychrosidis* Cushman principally as follows: Eyes sinuately emarginate opposite antennae; temples broader and more strongly convex; propodeal carinae weaker, the apical carina obsolete; thorax more coarsely sculptured throughout; mesoscutum with distinct, separated punctures, polished;

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[1] Ann. Soc. Ent. France, vol. 65, 1896, p. 389.

mesopleur strongly, obliquely striate; propodeum sparsely punctate before basal carina, rugosely roughened beyond; sides of areolet parallel; tergites callose apically, giving the abdomen the appearance of being constricted at the sutures.

In color much like the paler specimens of *polychrosidis*, but inner orbits obscurely brownish; pronotum above, scutellum, and posterior face of propodeum white, thorax otherwise black; antennae not white annulate; abdomen ferruginous with basal half of second tergite, sutures, and apical tergites black, seventh tergite with a white mark; middle joints of hind tarsus not white but fuscous with base reddish as is also the basal joint.

Host.—*Polychrosis viteana* Clemens.

Type locality.—North East, Pennsylvania.

Type.—Cat. No. 22851, U.S.N.M.

Described from two males reared July 5, 1917, from cocoons of host, under Quaintance No. 14456.

In Provancher's key to *Cryptus*[1] runs to *exilis* Provancher.

Genus CHROMOCRYPTUS Ashmead.

The undescribed type of this genus, *Chromocryptus albopictus* Ashmead MS., has come to light in the national collection. It runs in Thomson's Opuscula Entomologica key [2], directly to *Habrocryptus* Thomson. This is the genus from which it is finally separated by Ashmead in his original description. In general form and structure the genus is very similar to (*Habrocryptus*) = *Ischnus* Gravenhorst as represented by *assertorius* Fabricius and *brachyurus* Gravenhorst. It differs from *Ischnus* principally in having the head, especially the cheeks and temples, more rounded; the malar space shorter; the eyes less bulging; the antennae attenuate at apex; the thorax more coarsely and distinctly sculptured; the radius originating at the middle of the stigma; the areola with the intercubiti nearly parallel; the discoidal and brachial cells relatively shorter; the propodeum shorter, with the posterior face precipitate and concave, nearly completely areolated, the upper angles dentate, and the spiracles not quite circular; the first tergite distinctly elbowed and with the postpetiole more distinctly set off; the other tergites more coarsely and distinctly punctate. The body is more strikingly colored, the thorax and abdomen being tricolored and the coxae testaceous instead of black.

CHROMOCRYPTUS ALBOPICTUS Ashmead.

Female.—Length, 9 mm.; antennae, 7 mm.; ovipositor, 2 mm.

Head from above nearly twice as wide as long; temples nearly perpendicular to longitudinal axis of body, nearly flat; vertex precipitate behind, punctate; frons irregularly rugoso-punctate; eyes large, broad oval, nearly parallel within, the inner orbits above slightly tumid; face densely finely punctate, slightly elevated medially; clypeus set off by a broad groove, with a transverse apical impression extending entirely across, the apex broadly truncate, leaving a distinct opening between it and the mandible; mandibles narrowed at apex, equally bidentate; basal joints of flagellum long and slender, the first slightly longer than second, this distinctly longer than third, others gradually decreasing in length to near apex where they are quadrate, the flagellum attenuate at apex. Thorax coarsely sculptured throughout; pronotum laterally rugose, epomia distinct nearly to dorsal margin, which is slightly tumid; mesoscutum densely, confluently punctate, notauli distinct, subfoveolate (the pin obscures the posterior ends of the notauli, but they are sharp at least halfway back on the mesoscutum); scutellar fovea deep and with a few longitudinal striae; scutellum sparsely punctate, its lateral areas strongly longitudinally striate; postscutellum medially bifoveate, its lateral areas striate; mesopleurum rugoso-punctate above, densely punctate below, sternauli incomplete but deep, foveolate, curved dorsally; sternum densely punctate; prescutal carina complete; metapleurum and propodeum coarsely rugoso-punctate, the latter with short, blunt apophyses, behind which the surface is very coarsely reticulate rugose, areolation nearly complete, only the lateral longitudinal carinae being entirely wanting; nervulus slightly antefurcal; areolet pentagonal, sides slightly convergent, the intercubiti forming the longest sides; second recurrent straight, with a single broad bulla; nervellus broken far below middle, slightly inclivous; legs slender. First tergite polished, spiracles at apical fourth, petiole slender, postpetiole about four times as broad as petiole, dorsal carinae wanting, lateral carinae complete to apex; second and third tergites broad, strongly arched, callose at apex, densely, finely punctate; other tergites short, subpolished; ovipositor sheath about one and one-half times as long as first tergite.

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[1] Faun. Can. Ent., Hym., 1883, p. 329

[2] Fasc. 5, 1873, pp. 471 and 498.

Head black, orbits except narrow interruption in malar space, spot on clypeus, and spot on each mandible yellow; antennae black, with an incomplete white annulus on flagellar joints 6–11. Thorax black above, mesosternum and lower pleura, metasternum and pleura ferruginous, this color extending above bases of apophyses; anterior and superior margins of pronotum, two short lines on middle of mesoscutum, scutellum largely, a line on dorsal margin of mesopleurum and a spot just above sternaulus, an obscure spot at base of hind wing, upper portion of metapleurum, and the sides of the posterior face of the propodeum including the apophyses yellowish; legs testaceous; front and middle coxae in front and their basal trochanters apically and ventrally white; hind tibia at apex, basitarsus at base, and apical tarsal joint fuscous, tarsus otherwise white;

wings hyaline. First three tergites ferruginous, the third somewhat piceous; other tergites black, margined with white apically.

Type locality.—Urbana, Illinois.

Type.—Cat. No. 22852, U.S.N.M.

Described from the unique Ashmead type.

In his key to his family Phygadeuontoidae Foerster[1] includes a group of three genera separated from those that follow them by having the face clothed with glittering silky pile and with notauli extending at least to the middle of the mesoscutum. These are, in the order of their occurrence, *Thysiotorus*, *Apsilops*, and *Panargyrops*. The first is separated from the other two by its unbroken nervellus. On an earlier page (175) of the same work and in the family Hemiteloidae he separated off two other genera by identically the same characters. These are *Ischnurgops* and *Steganops*. Earlier in the key to the Hemiteloidae the nervellus character is employed. These two characters, the facial pubescence and the form of the nervellus, were therefore used by Foerster in one order in the Phygadeuontoidae and in the opposite order in the Hemiteloidae. Among the genera distinguished from *Ischnurgops* and *Steganops*, in which the nervellus is said not to be broken, is *Bathythrix* (p. 176) said to have a broken nervellus. The only character given by Foerster for separating the Hemiteloidae and Phygadeuontoidae is the incomplete areola of the former and the complete one of the latter. To none of these genera did Foerster assign species, and the only description of either that he offered is the sum of the characters that lead to it in the keys, including the characters employed to separate his families. To certain of these genera species have been assigned by later authors, as follows, only the first inclusion of species being listed:

Panargyrops (FOERSTER) SCHMIEDEKNECHT. Zool. Jahrb., vol. 3, 1888, p. 435. Two species: *Cryptus claviger* Taschenberg and *Leptocryptus heteropus* Thomson.

Thysiotorus (FOERSTER) BRISCHKE. Schr. naturf. Ges. Danzig, new ser., vol. 7, 1891, pt. 4, p. 71. Two species: *Hemiteles* (*Physiotorus*) (*sic*) *brevipennis* Brischke and *Hemiteles* (*Physiotorus*) (*sic*) *similis* Brischke.

Apsilops (FOERSTER) ASHMEAD. Trans. Amer. Ent. Soc., vol. 23, 1896, p. 207. One species: *Cryptus hirtifrons* Ashmead.

Bathythrix (FOERSTER) HOWARD. Bull. U. S. Dept. Agr., Bur. Ent., tech. ser. No. 5, 1897, p. 53. Two species: *Bathythrix meteori* Howard and *Bathythrix pimplae* Howard.

The first-mentioned species in each case was designated by Viereck[2] as the genotype.

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[1] Verh. nat. hist. Ver. Prov. preuss. Rheinland, vol. 25, 1868, pp. 181–182.

[2] Bull. 83, U. S. Nat. Mus., 1914.

In 1873 Thomson[1] first proposed his genus *Leptocryptus* in a key to the genera of Phygadeuonini. In a note following the key he says:

> "Of *Leptocryptus*, which in some ways is related to the Ophioninae, I know of no described species unless Taschenberg's *Panargyrops claviger* should possibly be referred here" (translation from the Swedish by Dr. Adam Böving).

The genus was not further characterized until 1884, when Thomson[2] published a formal description and tabulated and described nine species—*claviger* Taschenberg, *strigosus* Thomson, *lamina* Thomson, *aereus* Gravenhorst, *brevis* Thomson, *pellucidator* Gravenhorst, *geniculosus* Thomson, *rugulosus* Thomson, and *ruficandatus* Bridgman.

In 1905 and 1908 Schmiedeknecht[3] placed *Apsilops*, *Thysiotorus*, and *Panargyrops* in synonymy with *Leptocryptus* with the statement:

> The three Foersterian genera constitute the genus *Leptocryptus*, so neither name can be used for the united genus; they can not even be used to designate subgenera, since they are not sharply separable.

Roman[4] unites all of the genera thus far mentioned, except *Bathythrix*, together with *Ocymorus* Foerster under *Leptocryptus*, designating *Panargyrops* as a subgenus. The only species mentioned is *claviger* Taschenberg, which is definitely placed under the heading "Untergatt. *Panargyrops* Först." On the strength of this Viereck[5] designated *claviger* as the type of *Ischnurgops* and *Steganops*. This is obviously not in accord with the intention of Roman. The fact that *Leptocryptus* and *Panargyrops* are isogenotypic does not alter the case, for Roman says that the genus is divisible into two subgenera, one of which is *Panargyrops* and the other composed of the other Foersterian genera.

It seems to the writer that *Ischnurgops* and *Steganops*, together with *Ocynorus* which Viereck overlooked in his wholesale attempt at suppression of generic names, must be considered as still without properly included species. Furthermore, *claviger* differs from the descriptions of *Ischnurgops* and *Steganops* in having the areolet closed, and from the former further in not having the face strongly narrowed below. In the Phygadeuontoidae it can run only to *Panargyrops*, and this is the only Foersterian genus for which it can function as type. Although its first inclusion in *Leptocryptus* was somewhat doubtful, no such doubt was expressed by Thomson in his second mention of it; and Viereck's fixation of it as the type of that genus can not be questioned. *Leptocryptus* is therefore a strict synonym of *Panargyrops*.

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[1] Opusc. Ent., fasc. 5, 1873, p. 521.

[2] Idem., fasc. 10, 1884, pp. 963–966.

[3] Idem., fasc. 10, 1905, p. 727; Gen. Ins., fasc. 75, 1908, p. 9

[4] Naturw. Unters. Sarekg., vol. 4, 1909, p. 236.

[5] Bull. 83, U. S. Nat. Mus., 1914.

Of the species included by Thomson in *Leptocryptus* only four—*claviger*, *lamina*, *ruficaudatus*, and *geniculosus*—are represented in the National Collection. Of these, *lamina* runs to *Thysiotorus*, *ruficandatus* to *Apsilops*, and *geniculosus* to *Bathythrix*. This last is congeneric with *Bathythrix meteori* Howard, the genotype, and *Bathythrix pimplae* Howard. *Ruficaudatus* is very different from *Apsilops hirtifrons* Ashmead. The latter species has as its congener *Ichneumon cinctorius* Fabricius, the first species referred to *Dapanus* Foerster (by Ashmead) and *Sobas* Foerster (by Schmiedeknecht) and the basis of Thomson's genus *Trichocryptus*. By Foerster's definition of the Cryptoidae, *cinctorius* can not be the type of *Sobas*, for the propodeal areola is complete and the dorsal carinae of the petiole are present. These characters, regardless of their value in the sense in which they are employed by Foerster and regardless of the strictness of Foerster's own interpretation of them, constitute a part of his descriptions of all his Phygadeuontoid genera and must be strictly interpreted in the selection of types for his atypic genera. In the Phygadeuontoidae *cinctorius* and *hirtifrons* will run to no genus, for they agree with neither alternate under category 7. Therefore *cinctorius* can not serve as the type of *Dapanus*, nor *hirtifrons* of *Apsilops*. This leaves *Trichocryptus* Thomson as the name to be used for this genus, and *Dapanus* without properly included species. Subsequent to his inclusion of *hirtifrons* in *Apsilops*, Ashmead referred two other species to the genus, *Diaglypta radiata* Ashmead[1] and *Apsilops nigriceps* Ashmead.[2] Neither of these species is congeneric with *hirtifrons*. They belong rather to that group of the Hemitelini, in which the second intercubitus is entirely wanting and the first much reduced, and hence can not be types of the genera *Diaglypta* and *Apsilops*. Neither is more than subgenerically distinct from *Allocota* Foerster. *Apsilops* and *Diaglypta* are therefore without properly included species.

The two species referred by Brischke to *Thysiotorus* are unknown to the writer. They must both, however, be excluded as possible types of that genus for the areolet is lacking, which in Foerster's classification would place them in the Hemiteloidae instead of in the Phygadeuontoidae. The only other species referred to *Thysiotorus* is *Mesoleptus peregrinus* Cresson, so referred by Viereck.[3] This species can not be the genotype of *Thysiotorus* Foerster since it has the nervellus broken as shown by a recent examination of the type. This leaves *Thysiotorus* Foerster without a genotype. *Mesoleptus peregrinus* Cresson is a *Panargyrops* and has as its synonym *Panargyrops thoracicus* Cushman.

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[1] Trans. Ent. Soc. Lond., 1900, p. 268.

[2] Proc. U. S. Nat. Mus., vol. 29, 1905, p. 114.

[3] Idem., vol. 42, 1912, p. 645.

Brischke,[1] not Schmiedeknecht[2] as cited by Viereck, was the first to assign a species to *Chaeretymma* Foerster. Brischke's inclusions were: *Cryptus aereus* Taschenberg, *Cryptus ater* Brischke, and *Cryptus pellucidator* Gravenhorst, all subsequently placed by Schmiedeknecht in *Leptocryptus, ater* being synonymized with *claviger* Gravenhorst. *Cryptus aereus* and *pellucidator* are unknown to the writer, but *claviger* can certainly not be the type of *Chaeretymma,* for it is Phygadenontoid by Foerster's definition, not Cryptoid, and differs in other ways from the description of *Chaeretymma* Foerster. *Chaeretymma* Brischke, with *Cryptus ater* Brischke as type, is synonymous with *Panargyrops* Foerster.

The following corrections to Viereck's catalogue of genotypes are therefore necessary:

(**APSILOPS** Ashmead [1896])=**TRICHOCRYPTUS** Thomson.
Trans. Amer. Ent. Soc., vol. 23, 1896, p. 207. One species.
Type: *Cryptus hirtifrons* Ashmead. (Monobasic.)
Genotype congeneric with that of *Trichocryptus* Thomson.

(**APSILOPS** Ashmead [1900])=**ALLOCOTA** Foerster.
Trans. Ent. Soc. Lond., 1900, p. 268. One species.
Type: *Diaglypta radiata* Ashmead. (Monobasic.)

(**APSILOPS** Ashmead [1905])=**ALLOCOTA** Foerster.
Proc. U. S. Nat. Mus., vol. 29, 1905, p. 114. One species.
Type: *Apsilops nigriceps* Ashmead. (Monobasic.)

APSILOPS Foerster.
Verh. naturf. Ver. preuss. Rheinland, vol. 25, 1868, p. 182. No species.
Neither of the three species referred to *Apsilops* by Ashmead agrees with the description.
Atypic.

(**CHAERETYMMA** Brischke, not Foerster)=**PANARGYROPS** Foerster.
Schrift. naturf. Ges. Danzig, new ser., vol. 5, 1880, p. 338. Three species.
Type: (*Cryptus ater* Brischke)=*Panargyrops claviger* (Gravenhorst). (By present designation.)
Isogenotypic with *Panargyrops* Foerster.

CHAERETYMMA Foerster (Schmiedeknecht).
Verh. nat. Ver. preuss. Rheinl., vol. 25, 1868, p. 187. No species.
Ent. Nach., vol. 16, 1890, p. 150. Four species.
Type: *Cryptus furcator* Gravenhorst, Thomson. (By designation of Viereck.)
None of the three species included in 1880 by Brischke agrees with the description of *Chaeretymma* Foerster and neither can be the type.

DAPANUS Foerster.
Verh. naturf. Ver. preuss. Rheinland, vol. 25, 1868, p. 183. No species.
Ichneumon cinctorius Fabricius, designated by Ashmead as type, does not agree with description.
Atypic.

(**DIAGLYPTA** Ashmead)=**ALLOCOTA** Foerster.
Proc. Zool. Soc. Lond., 1895, p. 780. One species.
Type: *Diaglypta radiata* Ashmead. (Monobasic.)

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[1] Schrift. naturf. Ges. Danzig, new. ser., vol. 5, 1881, p. 338.

[2] Ent. Nachr., vol. 16, 1890, p. 150.

DIAGLYPTA Foerster.

Verh. naturf. Ver. preuss. Rheinland, vol. 25, 1868, p. 176. No species.

Diaglypta radiata Ashmead, the first species included, does not agree with original description.

Atypic.

ISCHNURGOPS Foerster.

Verh. nat. Ver. preuss. Rheinland, vol. 25, 1868, p. 175. No species.

Cryptus claviger Gravenhorst, designated as type by Viereck on supposed inclusion by Roman, was definitely excluded by Roman and furthermore does not agree with the description.

Atypic.

(**LEPTOCRYPTUS** Cameron)=**NEMATOPODIUS** Gravenhorst (according to Schmiedeknecht, Gen. Ins., fasc. 75, 1908, p. 149).

Mem. Manchester Lit. Philos. Soc., vol. 47, 1903, No. 14, p. 14.

Type: *Leptocryptus longiventris* Cameron. (Monobasic.)

(**LEPTOCRYPTUS** Thomson)=**PANARGYROPS** Foerster.

Opusc. Ent., fasc. 5, 1873, p. 521. One species.

Opusc. Ent., fasc. 10, 1884, p. 963. Many species.

Type: *Cryptus claviger* Gravenhorst. (By designation of Viereck.)

(**SOBAS** Schmiedeknecht)=**Trichocryptus** Thomson.

Ent. Nachr., vol. 16, 1890, p. 113. One species.

Type: *Ichneumon cinctorius* Fabricius. (Monobasic.)

Isogenotypic with *Trichocryptus* Thomson.

(**SOBAS** Foerster, preoccupied.)

Verh. nat. Ver. preuss. Rheinland, vol. 25, 1868, p. 187. No species.

Ichneumon cinctorius Fabricius included by Schmiedeknecht does not agree with description.

Atypic.

STEGANOPS Foerster.

Verh. nat. Ver. preuss. Rheinland, vol. 25, 1868, p. 175. No species.

Cryptus claviger Gravenhorst, designated as type by Viereck on supposed inclusion by Roman, was definitely excluded by Roman and does not agree with the description.

Atypic.

THYSIOTORUS Brischke, not Foerster.

Schr. naturf. Ges. Danzig, new ser., vol. 7, 1891, pt. 4, p. 71. Two species.

Type: *Hemiteles* (*Physiotorus*) (sic) *brevipennis* Brischke. By designation of Viereck.

(**THYSIOTORUS** Viereck, not Foerster)=**PANARGYROPS** Foerster.

Proc. U. S. Nat. Mus., vol. 42, 1912, p. 645. One species.

Type: *Mesoleptus*? *peregrinus* Cresson. (Monobasic.)

THYSIOTORUS Foerster.

Verh. nat. Ver. preuss. Rheinland, vol. 25, 1868, p. 181. No species.

Hemiteles (*Physiotorus*) *brevipennis* and *Hemiteles* (*Physiotorus*) *similis* Brischke, included by Brischke, do not agree with description.

Atypic.

TRICHOCRYPTUS Thomson=(**DAPANUS** Ashmead, not Foerster; **APSILOPS** Ashmead (1896), not Foerster; **SOBAS** Schmiedeknecht, not Foerster).

Opusc. Ent., fasc. 5, 1873, p. 520, 521. One species.

Type.—*Ichneumon cinctorius* Fabricius. (Monobasic.)

The writer does not wish to be construed as saying that all of these erroneously selected genotypes are erroneously referred to the Foersterian genera, but simply that these particular species can not function as genotypes of the genera in which they were the first included species. Many of these genera are based at least partially on characters that are certainly not of generic value. But until the genera are defined by properly fixed types the improperly fixed types must be excluded from the genera, and, if necessary, new generic names, assigned to them.

Genus **PANARGYROPS** Foerster.

Four nearctic species of this genus are known to me, and a note by S. A. Rohwer in regard to the type of (*Mesostenus*) *Mesoleptus sericeus* (Provancher) indicates that it too belongs here. The following key will separate the five species in the female. The male of only one species is known to me.

KEY TO NORTH AMERICAN SPECIES (FEMALES).

1. Thorax more or less rufous.............................*peregrinus* (Cresson).
   Thorax entirely black... 2.
2. Front and middle coxae and trochanters white; hind trochanters more or less blackish; scape white below... 3.
   Front and middle coxae and trochanters testaceous; hind trochanters not at all blackish; scape not white below .... 4.
3. A line in front of tegula white........................ *sericeus* (Provancher).
   White in front of tegula confined to humeral angle of pronotum. .*tibialis* (Cushman).
4. Tegulae pale; ovipositor barely two-thirds as long as abdomen or twice as long as first tergite ....*texanus*, new species.
   Tegulae fuscous; ovipositor nearly as long as abdomen or three times as long as first tergite...*pacificus*, new species.

PANARGYROPS SERICEUS (Provancher).

Mesostenus sericeus PROVANCHER, Nat. Can., vol 7, 1875, p. 264, male.
Mesostenus sericeus PROVANCHER, Nat. Can., vol. 11, 1879, p. 111, female.
Mesostenus sericeus PROVANCHER, Faun. Nat. Can. Hym., 1883, p. 345, female, male.
Mesoleptus sericeus (PROVANCHER), Faun. Ent. Can. Hym., 1883, p. 395.
Mesoleptus sericeus (PROVANCHER), Addit. Faun. Ent. Can., Hym., 1889, p. 362.

This species may have as a synonym *tibialis* (Cushman); but in a series of 17 specimens of both sexes of *tibialis*, every one has the white of the pronotum confined to a small spot on the humeral angle, and the black of the hind trochanter is in almost every case confined to the apical joint. Aside from these two characters there is nothing in Provancher's description that does not apply equally as well to *tibialis*.

PANARGYROPS TIBIALIS (Cushman).

Bathythrix tibialis CUSHMAN, Proc. U. S. Nat. Mus., vol. 53, 1917, p. 458, female, male.
Panargyrops tibialis (CUSHMAN), Proc. U. S. Nat. Mus., vol. 55, 1919, p. 528.

A series of eight females and four males reared from the type host and received subsequent to the publication of the original description shows considerable variation in the relative length of the tergites. The color is very constant except that one very small male has the hind coxae and both joints of the hind trochanter largely black. In the original description the length of the malar space should have been stated "slightly less than *half* as long as basal width of mandible."

PANARGYROPS PEREGRINUS (Cresson).

Mesoleptus? peregrinus Cresson, Trans. Amer. Ent. Soc., vol. 2, 1868, p. 102.
Thysiotorus peregrinus Viereck, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 645.
Panargyrops thoracicus Cushman, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 528.

PANARGYROPS TEXANUS, new species.

Female.—Length, 7.5 mm.; antennae, 4.5 mm.; ovipositor, 2.5 mm.

Differs from *tibialis* (Cushman) principally as follows: Antennae stout, sixth flagellar joint barely twice as long as thick (in *tibialis* the sixth joint is much more than twice as long as thick); ovipositor little more than half as long as abdomen; mandibles and scape below red, the former indistinctly yellowish in middle; humeral spot reddish; legs, except hind tibiae and tarsi, testaceous, front pair considerably paler but coxae and trochanters are not white, hind tibiae and tarsi reddish fuscous, trochanters not at all black.

Type locality.—Texas.

Type.—Cat. No. 22853, U.S.N.M.

One female from the Belfrage collection.

PANARGYROPS PACIFICUS, new species.

Female.—Length, 7 mm.; antennae, 5 mm.; ovipositor, 3 mm.

Differs from *tibialis* (Cushman) principally as follows: Scape below indistinctly reddish; tegulae piceous; humeral angle of pronotum not marked; legs testaceous, front pair palest, coxae and trochanters not white, hind trochanter with apical joint only faintly darker; tergites without distinct whitish apical margins.

Type locality.—San Juan Island, Washington.

Type.—Cat. No. 22854, U.S.N.M.

One female taken July 1–7, 1909, by W. M. Mann.

Genus THYSIOTORUS Foerster.

The new species described below is somewhat doubtfully referred to this genus.

As typified by the new species and its congener *Leptocryptus lamina* Thomson, *Thysiotorus* may be characterized as follows: Head transverse, broader than thorax, the temples strongly receding; eyes large, bulging, the inner margins straight and slightly convergent below; face narrow, little more than half as wide as eye is long, densely covered with long, shining, white pubescence; clypeus deeply transversely impressed before apex; malar space very short; cheeks very narrow; antennae slender, first flagellar joint much longer than second, which is subequal with the third; thorax clothed with rather long pubescence; notauli deep, terminating abruptly just before the scutellar groove; sternauli complete; propodeum with petiolar and posterior lateral areas confluent, otherwise completely areolated, with dense, long pubescence, the areola large, broadly hexagonal; wings broad; stigma and radial cell broad; areolet with the third abscissa of cubitus forming its shortest side, second intercubitus largely bullated but distinct; nervellus unbroken; legs slender, hind tibia slightly swollen near base, first tarsal joint nearly as long as the other four combined; the last much shorter than third; abdomen rather slender, broadest much behind the middle; first tergite sublinear, postpetiole but little wider than petiole, spiracles nearly at the middle; second tergite narrow at base, much broader at apex, as long as first tergite, or nearly, gastrocoeli distant from base; other tergites transverse, those beyond the fifth in female retracted; abdomen with a median pale mark beginning on apex of postpetiole, broadening out at the apex of each segment to the full width of the segment, and extending to the apex, segments beyond second sometimes entirely reddish; ovipositor sheath subequal in length to first tergite.

THYSIOTORUS? SMITHI, new species.

Female.—Length, 5 mm.; antennae, 3.5 mm.; front wing, 4 mm.

Head and thorax polished, practically impunctate; malar space hardly half as long as basal width of mandible; propodeum opaque; areola nearly equilaterally hexagonal; first tergite with spiracles very slightly beyond middle; postpetiole parallel-sided, longitudinally striate; second tergite striate nearly to apex, third striate in basal half; ovipositor sheath almost exactly as long as first tergite.

Black, with the usual pale tergal mark; antennae pale at base; mandibles pale; palpi tegulae and front and middle coxae and trochanters whitish; legs otherwise stramineous, except hind femur, which is pale testaceous, its tibia, which is infuscate especially at base and apex, and its tarsus which is fuscous; wings hyaline, venation blackish.

Male.—Very similar to female.

Type.—Cat. No. 22855, U.S.N.M.

Described from six females and two males, all collected by the late H. H. Smith, for whom the species is named. The series shows some minor variation in size, in the shape of the areola of the propodeum, and in the extent of the pale tergal mark. The last sometimes begins on the apex of the postpetiole and sometimes on the second tergite, the amount of black laterally corresponding.

Type locality.—Coleta, Alabama.

Other localities.—Pyziton, Clay County; and Langdale, Chambers County, Alabama.

Subfamily TRYPHONINAE.

Genus PHTHORIMA Foerster.

Only one North American species, *Phthorima borealis* Ashmead,[1] has been referred to this genus. This species is not Diplazonine. I would place it in the Tryphonini, where it runs fairly satisfactorily in Ashmead's Key to *Gastroporus* Foerster, to which no species has as yet been assigned and to which I somewhat doubtedly refer it.

But two species from the United States have recently been found in the miscellaneous undetermined material in the National Museum and are described herewith. Of one of them Mr. H. L. Viereck has reared four specimens, which he has generously permitted the writer to add to the meager material already at hand. These specimens emerged from aphid galls on witch-hazel, where they were presumably parasitic on some species of Syrphid fly. The strongly compressed and extensible abdomen is evidently an adaptation for oviposition in the peculiar situation where its host lives.

(PHTHORIMA) GASTROPORUS? BOREALIS (Ashmead).

PHTHORIMA EXTENSOR, new species.

Female.—Length, 8.5 mm.; abdomen, 6 mm. (in an extended specimen of same size as much as 9 mm.); antennae, 4.5 mm.

Head strongly narrowed behind eyes; vertex very minutely coriaceous, subopaque; frons and face shining, minutely punctate; malar space scarcely as long as basal width of mandible and without a distinct furrow; clypeus flat with a narrow reflexed margin, truncate at apex, punctate; thorax above densely, finely punctate; pronotum shining, sparsely punctate above, coriaceous below; mesopleurum polished, sparsely, minutely punctate; sternum more densely so; sternauli broadly impressed; metapleurum opaque, punctato-rugulose; propodeum irregularly rugulose, especially on posterior face, the carinae indistinct, the posterior face not especially precipitous; areolet, sessile; nervulus strongly postfurcal; nervellus strongly broken not far below middle; compression of abdomen embracing more or less of second tergite, which is strongly sculptured only at base and scarcely half as wide at base as long; first tergite distinctly wider from base to spiracles than beyond; little more than half as wide at apex as long.

Black; middle of face, a larger or smaller spot at each side of clypeus, mandibles, palpi, a cuneiform spot on each side of mesoscutum adjacent for its entire length to the pro-mesonotal suture, tegulae, humeral angle of pronotum, subalar spot, and meso-metapleural suture white or whitish; antennae black; front and middle legs pale testaceous, their coxae, trochanters and tarsi white, the last reddish at apex; hind coxae and femur testaceous, trochanter stramineous, tibia stramineous with apex reddish below and fuscous above, tarsal joints white, fuscous at apices, the last two joints entirely fuscous; wings hyaline.

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[1] Proc. Wash. Acad. Sci., vol. 4, 1902, p. 226.

Type locality.—Virginia shore of Potomac River, near Plummer's Island, Maryland.

Other locality.—Georgetown, District of Columbia.

Type.—Cat. No. 22856, U.S.N.M.

Described from five females, four reared by H. L. Viereck from an aphid gall (*Hamamelistes spinosus* Shimer?) on witch-hazel (*Hamamelis virginiana* Linnaeus) at the type locality, and one captured by H. H. Smith at Georgetown, District of Columbia.

Some of the paratypes have the anterior corners of the scutellum and the mesopleura and metapleura below and sides of propodeum more or less reddish, while in *b* and *c* the corners of the scutellum have a distinct whitish spot. The Georgetown specimen (paratype *d*) is considerably larger, being, with the much distended abdomen 13 mm. in length.

PHTHORIMA SULCICLYPEUS, new species.

Differs from *extensor* Cushman principally as follows:

Length, 7 mm.; abdomen, 4.5 mm.; antennae (broken);

Vertex shining, punctate; malar space fully as long as basal width of mandible and with a distinct furrow extending from eye to dorsal articulation of mandible; clypeus polished, inflexed from near base, the apical slope with a deep median furrow, emarginate at apex, thorax similar in sculpture, though perhaps less strongly sculptured, and with the metapleurum with simple, sparse punctuation; posterior face of pronotum steeply precipitous; areolet petiolate; nervulus weakly post-furcal; nervellus weakly broken far below middle; compression of abdomen not embracing second tergite, which is fully two-thirds as wide at base as long and strongly scupltured over most of its surface; first tergite not wider at base than at apex and about two-thirds as wide at apex as long.

Black with the same white markings on head and thorax and in addition with the lower cheeks, the sides of scutellum, postscutellum and lower part of mesopleurum also white; hind tibia reddish fuscous at base, white in middle, fuscous at apex, tarsus fuscous except at extreme base of basal joint.

Type locality.—Mount Washington, New Hampshire.

Type.—Cat. No. 22857, U.S.N.M.

One female specimen.

Subfamily OPHIONINAE.

Tribe CAMPOPLEGINI.

Genus ANGITIA Holmgren.

ANGITIA GALLERIAE, new species.

This species is extremely variable both in size and structure, the extremes being so different that were they compared without the intermediate variations one could not but consider them to be different species. Moreover the extremes run very close to the typical forms of *Campoplex* Gravenhorst and *Sesioplex* Viereck. Fortunately the type series consists of a number of specimens, all from the same source at the same time and displaying a gradual variation from one extreme to the other.

The formal description is based entirely on the holotype, while the points of variation are taken up in a separate paragraph. The holotype is selected from near the middle of the series of females.

Female.—Length, 8 mm.; antennae, 4.5 mm.; ovipositor, 1.75 mm. Temples strongly, convexly receding, occiput broadly concave, eyes sinuately emarginate within; face very slightly narrower than frons; malar space slightly more than half the basal width of mandible; cheeks in front view straight; diameter of lateral ocellus distinctly more than half as long as postocellar line, which is about twice the ocell-ocular line; antennae tapering at apex; head and mesoscutum opaque without distinct punctures; pronotum laterally striate; mesopleurum, mesosternum, and metapleurum minutely, opaquely punctate; sternauli broadly impressed anteriorly; scutellum minutely punctate, subpolished at base; propodeum laterally subpolished coriaceous, medially transversely, irregularly regulose, the carinae distinct and complete except that separating the areola and petiolar areas, the basal area broad at apex; legs rather stout, tibiae more or less compressed, inner calcarium of hind tibia slightly longer than half the basitarsus; areolet large, shortly petiolate, recurrent received at middle; nervulus perpendicular, curved, petiole slightly broader than thick, with a rather deep fovea on each side, the area between this and the base flat, the dorso-lateral carina obsolete; post-petiole slightly though distinctly thicker, longer than broad, the sides weakly curved dorsally with a median and two lateral impressions just behind the spiracles; second tergite three-fifths as wide at base as long, a half longer than third, its sides weakly divergent, the spiracles at about the middle, gastrocoeli distinct, nearly circular, removed from base of segment by about their diameter; ovipositor sheath about one and one-half times as long as first tergite.

Black; mandibles, palpi, and tegulae white; scape and pedicel reddish beneath, antennae otherwise black, hind and middle coxae black, the latter reddish beneath; front coxae largely reddish, paler at apex and black at extreme base; front and middle trochanters and apical joint of hind pair white; basal joint of hind trochanter black; hind tibia reddish fuscous, paler above, whitish at extreme base and with black apical and subbasal annuli, this pattern repeated without the black in middle and front tibiae, which are pale yellow above in the middle; hind tarsi fuscous, the joints paler at base but without definite white annuli; other tarsi of similar pattern but paler; femora testaceous, hind femur not black at apex; second tergite distinctly and third faintly reddish laterally.

Of the eight females in the type series four are larger and three smaller than the type, the largest being 9.5 mm. and the smallest 5.5 mm. long.

The smallest (paratype *g*) is more slender than the type; the head and thorax are very similar to those of the type, but the median areas of the propodeum are much narrower, the areola being practically acute at base; the venation differs only minutely; the first tergite has the postpetiole strongly swollen above, distinctly longer than wide and without the dorsal impressions; the petiole is scarcely flattened above, as wide as thick, and the lateral foveae are shallow, while the dorso-lateral carinae are obliterated; the second tergite is fully twice as long as wide at base with the gastrocoeli farther removed from the base.

The largest specimen (paratype *a*) is somewhat stouter than the type, and differs from it further as follows: The median propodeal areas are wider and slightly concave; the nervulus is distinctly postfurcal and nearly perpendicular; the first tergite is so much depressed that the petiole is much broader than thick, broadly flattened both above and below, and the postpetiole scarcely thicker than the petiole; the lateral fovea very deep, the area in front of it distinctly concave, and the dorso-lateral carina very strong and curving around the fovea; the postpetiole broader than long with the dorsal impressions large and deep; second tergite scarcely a half longer than broad at base, its sides widely divergent, barely a third longer than fourth; ovipositor sheath less than one and one-half times as long as first tergite.

Paratypes *b*, *c*, and *d* vary in that order from paratype *a* to the type, and *e* and *f* vary from the type toward paratype *g*. The species is very constant in color, about the only variation being in the extent of red on the tergites.

The male is more slender than the female, has the scape and the front and middle coxae paler, but otherwise is very similar. The only males in the type series are one corresponding to the larger females and one corresponding to the smaller females. The larger (the allotype) is 8.5 mm. long and the smaller (paratype *h*) 5.5 mm.

Host.—*Galleria mellonella* Linnaeus.

Type locality.—Lansing, Michigan.

Type.—Cat. No. 22858, U.S.N.M.

Described from the above 10 specimens reared by Prof. R. H. Pettit from the host in a honey storage room.

Tribe CREMASTINI.

Since my revision of the North American Cremastini[1] was published I have had opportunity to examine the types of the Cresson and Davis species of *Cremastus* not tabulated in that paper; also several new species of *Cremastus* have come to hand. Further study of certain other so-called tribes of the Ophioninae convinces me that the tribe Pristomerini of Ashmead and the genus *Eiphosoma* Cresson should be referred to this tribe. The relation of *Eiphosoma* to *Cremastus* was pointed out by Cresson himself in his original description, and he retained it in this position in his Hymenoptera Texana (1872). Roman[2] goes so far as to include it in the Cremastini. Aside from the possession of the femoral tooth these groups differ in no radical way from *Cremastus* or the other genera heretofore assigned to the Cremastini. The very elongate form of *Eiphosoma* and the short, stout form of *Pristomerus* are both found in *Cremastus.* The structure of head, thorax, and abdomen differs only in minor details from that of *Cremastus,* while the venation is practically the same except for the more frequent occurrence of the areolet in *Eiphosoma.* In general *Eiphosoma* is very like the typical *Cremastus* with the clypeus less distinctly separated, the propodeum usually less completely areolated, the areolet more frequently present, and the propodeal "neck" shorter; while *Pristomerus* is so similar to certain species of the subgenus *Zaleptopygus* that were it not for the toothed femora they would fall very nicely into that group.

The characters used in my earlier paper to distinguish the Cremastini from the Porizonini do not all apply to both *Eiphosoma* and *Pristomerus,* nor, for that matter, to certain new species of *Cremastus* described below. The abdomen is not always strongly compressed though always distinctly so; and in *Eiphosoma* and *Pristomerus* the intercubitus is not always longer than the second abscissa of cubitus, but is always distinct. *Xiphosomella* Szepligeti is said to have the intercubitus very short or lacking, but it is evidently closely related to *Eiphosoma.*

The following key to genera is that of my earlier paper with *Eiphosoma, Pristomerus,* and a new genus added.

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[1] Proc. U. S. Nat. Mus., vol. 53, 1917, pp. 503–551.

[2] Arkiv. för zoologie, vol. 9, No. 9, 1915, p. 6.

KEY TO NORTH AMERICAN GENERA OF CREMASTINI.

1. Hind femur with a tooth beneath.................................2.
   Hind femur normal ....3.
2. Stigma narrow lanceolate, radius at or before middle; petiole with tergite entirely enclosing sternite except at extreme apex and base, its lateral edges fused beneath, the suture obsolete; tooth of hind femur at apical fourth or fifth; compression of abdomen including second tergite; very long, slender species..................*Eiphosoma* Cresson.
   Stigma broad triangular, radius more or less behind middle; first tergite not enclosing sternite; tooth of hind femur at or before apical third; second tergite not compressed; short, stout species....................*Pristomerus* Curtis.
3. Areolet present; upper surface of abdomen in female very largely covered by three segments, those beyond third very short.......... *Oligotmema*, new genus.
   Areolet absent; segments beyond third not especially retracted...............4.
4. (Key to this group already published.)

Genus EIPHOSOMA Cresson.

Eiphosoma CRESSON, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 52, fig. 5.
Xiphosoma (Cresson) SZEPLIGETI, Gen. Ins., fasc. 34, 1905, p. 4.

As stated above Cresson considered this genus to be related to *Cremastus*. Because of its toothed femora Ashmead[1] placed it in his tribe Pristomerini; but later,[2] apparently because of its narrow stigma, he removed it to the Anomalini, where it is obviously discordant. Morley[3] follows in the footsteps of Ashmead, though calling attention to the obvious relationship to *Pristomerus*. Szepligeti[4] erected his subfamily Xiphosominae for this genus and his *Xiphosomella*, but maintained it in close proximity to the Anomalinae, though calling attention to it under the Pristomerinae. Except Cresson and Roman apparently no one has thought of allying it with *Cremastus*, all writers ascribing too much importance to the shape of the stigma and the femoral tooth, neither character in the opinion of the writer of more than generic value. Schmiedeknecht,[5] however, while still using the form of the stigma as his prime character, in his arrangement places the Xiphosomini as Tribe No. 13, the Pristomerini as No. 9, and the Cremastini as No. 10, the Porizonini and Plectiscini falling between the Cremastini and Xiphosomini.

Viereck divided the genus, making *Eiphosoma pyralidis* Ashmead the type of his genus *Brachyxiphosoma*. His description consists of the statement of two characters by which it is said to differ from *Eiphosoma*. Both of these characters, the length of the malar space and the distance to which the propodeum overlies the hind coxae, are very variable and are not always associated in the combination indicated by Viereck. *Brachyxiphosoma*, in the opinion of the writer, is doubtfully of even subgeneric rank, but is so trecated here, since the genotype does differ from most of the species of *Eiphosoma* in its unusually short malar space, in having the propodeum completely areolated and in having the ground color of the thorax black.

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[1] Trans. Amer. Ent. Soc., vol. 23, 1896, p. 191.
[2] Proc. U. S. Nat. Mus., vol. 23, 1900, p. 88.
[3] Rev. Ichn., pt. 2, 1913, p. 51.
[4] Gen. Ins., fasc. 34, 1905, p. 2.
[5] Opusc. Ichn., fasc. 18, 1908, p. 1409.

Very long and slender, abdomen very strongly compressed, the compression embracing the second tergite; head very strongly transverse, the temples strongly sloping; eyes and ocelli large; antennae about half as long as body; thorax rather stout; notauli deep anteriorly, becoming obsolete posteriorly; sternauli short but deep; propodeum sloping, more or less completely areolated but usually not completely so; acrolet, if present, oblique and petiolate; legs very slender; hind femur slender at base, with a small tooth beneath at apical fourth or fifth; hind trochanters very long, the two joints subequal in length, basal joint very strongly oblique at apex; abdomen more than twice as long as head and thorax together; first tergite enclosing sternite; second tergite at least as long as first, usually longer; ovipositor less than half as long as abdomen.

The following key includes both the subgeneric and specific characters of the North American species.

KEY TO NORTH AMERICAN SPECIES.

1. Propodeum completely areolated (only the middle portions of the longitudinal carinae sometimes obsolete); malar space less than half as long as basal width of mandible; thorax black with yellow markings (subgenus *Brachixiphosoma* Viereck).......................................*pyralidis* Ashmead.

   Propodeum with only the transverse carinae distinct, longitudinal carinae and frequently the apical carina absent or obsolete; malar space at least half as long as basal width of mandible; thorax yellow with black markings (subgenus *Eiphosoma* Cresson)..2.

2. Malar space half as long as basal width of mandible; face strongly elevated medially; propodeum and metapleurum separated by a distinct carina..*septentrionale* Brues.

   Malar space distinctly more than half as long as basal width of mandible; face not especially strongly elevated; propodeum and metapleurum separated by a crenulate groove..3.

3. Propodeum polished, sparsely punctured laterally and at most weakly rugulose medially, median impression broad; groove separating propodeum and metapleurum shallow and distinctly crenulate, in male subcarinate.*texanum* Cresson.

   Propodeum opaque throughout, median impression narrow; groove separating propodeum and metapleurum deep and indistinctly crenulate...*bruesi*, new species.

Subgenus BRACHIXIPHOSOMA Viereck.

Brachixiphosoma VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 147.
Type.—Eiphosoma pyralidis Ashmead.

Only two species have been referred to this subgenus. The type is North American. The other, *insularis* Viereck, is West Indian. It has the malar space only slightly shorter than the basal width of the mandible, while the propodeal "neck" is not appreciably longer than that of the type of *Eiphosoma*. Moreover, *insularis* lacks all of the propodeal carinae except the two transverse carinae and the basal portion and sometimes the apical portion of the median carinæ. In the present arrangement it would fall in the typical subgenus.

EIPHOSOMA (BRACHIXIPHOSOMA) PYRALIDIS Ashmead.

Eiphosoma pyralidis Ashmead, Trans. Amer. Ent. Soc., vol. 23, 1896, p. 191.
Brachixiphosoma pyralidis (Ashmead) Viereck, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 147.

In addition to the key characters and those mentioned by Ashmead in the original description, the following are perhaps worthy of note. Clypeus in female very broadly rounded, barely half as long as wide, in male subtruncate for its entire width; face medially elevated, slightly narrower than frons; diameter of lateral ocellus subequal to postocellar line and slightly greater than ocell-ocular line; thorax rather densely punctate, the punctures of metapleura smaller; scutellum impunctate; apical carina of propodeum arched in middle; radius before middle of stigma; petiole of areolet shorter than rest of first intercubitus; nervulus interstitial; hind coxae except at apex black.

EIPHOSOMA (EIPHOSOMA) INSULARIS Viereck.

Eiphosoma (*Brachixiphosoma*) *insularis* Viereck, Proc. U. S. Nat. Mus., vol. 44, 1913, p. 564.

EIPHOSOMA (EIPHOSOMA) SEPTENTRIONALE Brues.

Eiphosoma septentrionale Brues, Psyche, vol. 18, 1911, p. 22.

There are four females of this species in the National Museum, two from Coleta, Alabama, (H. H. Smith), and one each from College Park, Maryland, and Washington, District of Columbia (both collected by Frederick Knab).

Clypeus broadly subtruncate, strongly convex, two-thirds as long as wide; malar space half as long as basal width of mandible; face elevated medially, equal in width to frons; diameter of lateral ocellus equal to postocellar line and twice as long as ocell-ocular line; thorax sparsely punctate, propodeum and metapleura very obscurely so; propodeum with both transverse carinae, but median carinae developed only before basal and behind apical carinae, sometimes absent in latter position, apical carina medially curved backward; radius before middle of stigma; petiole of areolet equal to or longer, in one specimen much longer, than rest of first intercubitus; nervulus interstitial; hind coxae testaceous and yellow, more or less blackish within.

EIPHOSOMA (EIPHOSOMA) TEXANUM Cresson.

Eiphosoma texanum Cresson, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 176.

Malar space slightly shorter than basal width of mandible; clypeus strongly rounded at apex, two-thirds as long as broad; separation from face weak; face distinctly narrower than frons, not strongly elevated medially; ocell-ocular and postocellar lines and diameter of lateral ocellus in female subequal, ocelli in male a trifle larger; thorax sparsely punctate, more densely so on mesoscutum, least densely so on side of propodeum, latter polished medially, apical carina weak and curved backward medially; radius in middle of stigma; petiole of areolet about equal to rest of intercubitus; nervellus postfurcal; hind coxae black and white; black color of thorax more extensive than in following species, covering about as much area as yellow; lateral black mark of propodeum reaching nearly to apex and embracing the spiracle.

EIPHOSOMA (EIPHOSOMA) BRUESI, new species.

Allied to *texanum* Cresson and runs to that species in Brues' key [1] to the species of the genus; but differs principally as follows from specimens of that species in the United States National Museum:

Female.—Length, 10 mm.; antennae, 4.5 mm.; ovipositor, 2.5 mm.

Malar space distinctly shorter than basal width of mandible; face only slightly narrower than frons; ocelli larger, being nearly twice as long as ocell-ocular line; thorax and propodeum rather densely punctate; yellow color of thorax more extensive than black, lateral mark of propodeum small, not extending nearly to apex and confined to depression between propodeum and metapleurum, interrupted or constricted at spiracle.

Agrees with above description of *texanum* otherwise.

Type locality.—Granger, Texas.

Type.—Cat. No. 22859, U.S.N.M.

Described from two females, the type taken May 20, 1895, and determined by Ashmead as *texanum*. The paratype is labeled merely "Hunter No. 2505 P. X."

The paratype differs from the type but very little, the lateral mark on the propodeum being slightly larger, and the areolet of the right wing being entirely lacking while that of the left wing is very small and poorly defined.

Named in honor of Dr. C. T. Brues, of the Bussey Institution, Cambridge, Massachusetts.

Genus PRISTOMERUS Curtis.

In all published arrangements of the tribes of the Ophioninae the tribe Pristomerini has been placed next to the Cremastini and separated from that tribe only by the character of the toothed hind femora. Schmiedeknecht [2] mentions several other characters, principally of venation, in his description of the tribe, all of which are to be found in one or another of the genera that he places in the Cremastini. In his tribal key he modified the femoral character to include *Demophorus* Thomson, said to have the femora incrassate but not toothed.

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[1] Psyche, vol. 18, 1911, p. 21.

[2] Opusc. Ichn., fasc. 18, 1908, p. 1409.

Mostly rather stout species, the compression of the abdomen not embracing second tergite; head strongly transverse, temples sloping; eyes and ocelli large; antennae somewhat more than half as long as body; thorax stout; notauli distinct anteriorly, obsolete posteriorly; sternauli obsolete; propodeum rounded; completely areolated; areolet very rarely defined, if so oblique and petiolate; hind femur more or less swollen and with a more or less distinct tooth beneath situated from shortly behind middle to apical third, frequently followed by a row of denticles; hind trochanters short; abdomen less than twice as long as head and thorax together; first tergite longer than second, not enclosing sternite; ovipositor more than half as long as abdomen.

The following key includes both the subgeneric and specific characters of the North American species. Ashmead's genus *Pristomeridea*, based on the size and position of the femoral tooth, the shape of the areola, and the form of the nervellus must be considered as a synonym of *Pristomerus*, since all of these characters are subject to great variation. *Neopristomerus* Viereck is so much more closely allied to *Pristomerus* than to any of the other genera of the tribe as here treated that it must be considered subgeneric. Moreover, the two characters given by Viereck are not always associated. The eyes throughout *Pristomerus* vary greatly in their relation to each other, especially in the male. The obsolete cubitus and subdiscoideus do not furnish an absolute character, for some species have these veins thick for a short distance and then rather suddenly weakening, though still distinct to the apex of the wing. The species *dubia* Brues, *coloradensis* Brues, and *pacificus* Cresson are not represented in the material studied, and their insertion in the key is based on the characters ascribed to them by Brues[1] in his key to species.

KEY TO NORTH AMERICAN SPECIES.

1. Wings with an areolet; second discoidal cell very narrow at base; ovipositor not sinuate near apex (subgenus *Areolopristomerus* Cushman)............ 2.
   Wings without an areolet; third discoidal cell not especially narrow at base; ovipositor sinuate near apex.. 3.
2. First joint of flagellum longer than second; propodeum not excavated behind; second tergite shorter than first, striate throughout.............. *smithi*, new species.
   First two joints of flagellum equal in length; propodeum excavated behind; second tergite as long as first, shining on basal third.............. *dubia* (Brues).
3. Cubitus and subdiscoideus extending to margin of wing, former straight or slightly curved at base, but the base not directed sharply forward; second abscissa of cubitus longer than intercubitus (subgenus *Pristomerus* Curtis). 4.
   Cubitus and subdiscoideus not extending much beyond recurrent, being represented beyond by folds or streaks; second abscissa of cubitus shorter than intercubitus (subgenus *Neopristomerus* Viereck).................... 8.

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[1] Psyche, vol. 18, 1911, p. 23.

4. Head in front view not or barely wider than long, seen from above with temples strongly rounded; eyes in male subparallel within, ocelli not especially large; wings stained with brown; thorax largely black with scutellum red .... *fuscipennis*, new species.
Head in front view distinctly wider than long, seen from above with temples weakly rounded and much narrowed; eyes in male convergent above, ocelli very large; wings hyaline; thorax largely red, or if black the scutellum is also black .... 5.
5. Black with prothorax rufous .... *laticeps*, new species.
Thorax and abdomen largely red .... 6.
6. Eye fully a third longer than wide; ocelli large, lateral ones in female closer together than their greatest diameter, in male touching the eyes; malar space barely half as long as basal width of mandible... *ocellatus*, new species.
Eye barely a fourth longer than wide; ocelli smaller, lateral ones in female removed from each other by their diameter, in male distinctly removed from eyes; malar space much more than half as long as basal width of mandible .... 7.
7. Clypeus broadly truncate; radius weakly curved at apex; base of third discoidal cell nearly as long as apical abscissa of discoideus (a larger species) .... *agilis* (Cresson).
Clypeus broadly rounded at apex; radius strongly curved at apex; base of third discoidal cell barely half as long as apical abscissa of discoideus (a very small species) .... *minutus*, new species.
8. Areola distinctly longer than broad, apical abscissa of subdiscoideus distinct at base .... 9.
Areola scarcely longer than broad; apical abscissa of subdiscoideus obsolete to base .... 10.
9. Body entirely ferruginous, at most with the tergites blackish basally .... *melleus*, new species.
Thorax at least partly black or piceous .... *appalachianus* Viereck.
10. Hind coxae almost entirely black; wings clear hyaline; second discoidal cell strongly contracted at base .... *coloradensis* Brues.
Hind coxae entirely ferruginous; wings tinged with yellow; second discoidal cell less strongly contracted at base .... *pacificus* Cresson.

AREOLOPRISTOMERUS, new subgenus.

Differs from *Pristomerus* Curtis principally in the possession of the areolet and the very narrow base of the second discoidal cell.

Type.—*Pristomerus* (*Areolopristomerus*) *smithi* Cushman.

PRISTOMERUS (AREOLOPRISTOMERUS) SMITHI, new species.

Female.—Length, 8 mm.; antennae, 5 mm.; ovipositor, 2.5 mm.

Head in front view much wider than long, in dorsal view strongly transverse, the temples nearly flat and very narrow; face very narrow, two-thirds as wide as length of eye; eyes large, parallel within, but slightly sinuate opposite antennae; malar space two-thirds as long as basal width of mandible; diameter of lateral ocellus subequal to ocell-ocular line and slightly longer than postocellar line; antennae slightly below middle of eyes, first flagellar joint longer than second; thorax mostly opaque shagreened with weak scattered punctures; pronotum polished laterally; mesopleural impression striate; scutellum subpolished; propodeum not excavated behind, opaque shagreened, areola pentagonal, twice as long as wide, costulae at anterior third, spiracles, small oval; legs slender, femoral tooth at apica third, very small, denticles obsolete, calcarium of hind tibia reaching nearly to middle of basitarsus; abdomen rather slender; second tergite nearly as long as first, three times as long as wide at base, striate, as are also postpetiole and base of third; other tergites polished.

Pale rufo-fulvous; face, clypeus, mouth parts, scape and pedicel, and legs largely stramineous; first tergite in middle, second and third, at base, and fourth to sixth dorsally piceous; basal joint of hind trochanter on inner side, tibia at base and apex, and tarsus except major part of first joint fuscous; wings hyaline, stigma black with anterior margin pale.

Type locality.—Pyziton, Clay County, Alabama.

Other localities.—Coleta, Alabama, and College Station, Texas.

Type.—Cat. No. 22860, U.S.N.M.

Described from three females, the two Alabama specimens collected by the late H. H. Smith, for whom the species is named, and the Texas specimen by Nathan Banks.

Paratype *a* has the body and the hind femora and coxæ more rufous and the femora slightly infuscate inside.

PRISTOMERUS (AREOLOPRISTOMERUS) DUBIA (Brues).

Pristomeridia (?) *dubia* BRUES, Psyche, vol. 18, 1911, p. 24, female, pl. 6, figs. 9 and 10.

This species, which Brues doubtfully placed in *Pristomeridia,* is evidently very closely related to *smithi* Cushman. A comparison of Brues's description with *smithi* shows the following differences: First, two joints of flagellum equal in length; propodeum excavated behind, basal area quadrangular; spiracles round; second tergite as long as first, shining on basal third; wings slightly infuscated apically; posterior femora largely piceous.

The unique type is from Blue Hills, near Boston, Massachusetts.

Subgenus PRISTOMERUS (Curtis).

Pachymerus GRAVENHORST, Ichn. Eur., vol. 3, 1829, p. 721 (part).
Pristomerus CURTIS, Brit. Ent., vol. 13, 1836, p. 624.
Pristomeridea ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 100.

PRISTOMERUS (PRISTOMERUS) FUSCIPENNIS, new species.

Female.—Length, 5.0 mm.; antennae, 3.5 mm.; ovipositor, 2.5 mm.

Head in front view barely wider than long, seen from above with temples strongly rounded, opaque shagreened, face sparsely punctate; eyes parallel within; clypeus convex, broadly truncate at apex, two-thirds as long as broad; malar space nearly as long as basal width of mandible; ocelli in a nearly equilateral triangle; diameter of lateral ocellus, postocellar and ocell-ocular lines subequal; thorax dorsally opaque, mesoscutum shagreened and punctate; pronotum polished, rugulose in impressions; mesopleura and metapleura subpolished and punctate, punctures on mesopleura rather coarse and well separated; fossa in front of scutellum deep, the scutellum nearly carinate in front; propodeum densely punctate dorsally and laterally, rugose posteriorly, areola pentagonal, somewhat more than twice as long as wide, costulae very near cephalic end; femoral tooth short, at about apical two-fifths, denticles absent, the femur slightly less than a third as thick as long; stigma nearly two-thirds as wide as long, radius at apical third; nervulus distinctly postfurcal; second and third abscissae of discoideus equal in length; nervellus slightly broken, weakly inclivous; postpetiole and second tergite finely striate, others obscurely shagreened, second nearly twice as long as wide at base, the sides widely divergent, ovipositor four-fifths as long as abdomen.

Head black, face, orbits, cheeks, clypeus, and mandibles fulvous; antennae black, scape and pedicel fulvous beneath; thorax black, prescutum and scutellum red, notauli faintly reddish; tegulae and wing bases yellow; wings infumate hyaline; legs fulvo-testaceous, hind trochanters dorsally at base piceous, second joint and apex of femur yellow, tibia and tarsus fuscous, tibia pale in middle, calcaria yellow; abdomen piceous, all tergites except first yellow at apex and more reddish laterally, first with postpetiole reddish.

Male.—Differs from the female in having the tergites relatively narrower and the hind femur stouter, with the tooth larger and at the apical third and the denticles well developed.

Type locality.—Onaga, Kansas.

Other localities.—Chain Bridge, District of Columbia; Oswego, New York.

Type.—Cat. No. 22861, U.S.N.M.

Described from six specimens, the type and allotype from the type locality (Crevecoeur); a female, paratype *a*, from Chain Bridge, District of Columbia, September 15, 1912 (J. R. Malloch); and three males, paratypes *c*, *d*, and *e*, from Oswego, New York, August 27, 1896.

All of the paratypes have the face more or less marked with blackish. The color of the abdomen varies somewhat, especially that of the first tergite which varies from entirely red to entirely piceous.

PRISTOMERUS (PRISTOMERUS) OLAMONUS Viereck.

Pristomerus olamonus Viereck, Hym. Conn., 1917, p. 274.

Described only by color and the length of the ovipositor, it can not be placed in the key to species. What characters are given by Viereck are very suggestive of *fuscipennis* Cushman, except that the color pattern is brown rather than fulvous and reddish.

PRISTOMERUS (PRISTOMERUS) LATICEPS, new species.

Differs from *fuscipennis* principally as follows:

Female.—Length, 5 mm.; antennae, 4 mm.; ovipositor, 3 mm.

Head in front view strongly transverse, seen from above with temples flat and very narrow; inner margins of eyes slightly concavely curved; malar space much narrower than mandible at base; diameter of lateral ocellus nearly twice as long as ocell-ocular line, which is subequal to postocellar line; mesoscutum opaque shagreened but impunctate; thorax laterally and propodeum dorsally very sparsely punctate, subopaque; areola hardly twice as long as wide, costulae at cephalic third; hind femur barely one-fourth as thick as long, tooth long, denticles distinct; nervulus interstitial; second tergite distinctly more than twice as long as wide at base, its sides weakly divergent; ovipositor as long as abdomen.

Head black, apex of clypeus piceous, mandibles yellow; thorax black with only pronotum red; front and middle legs pale testaceous, coxae and trochanters stramineous; hind coxae rufous, piceous within, trochanters pale, basal joint piceous within, tibia reddish piceous, yellow at apex, tibia and tarsus fuscous, former pale in middle and with calcaria white; wings hyaline; abdomen entirely piceous except yellowish or whitish margins of all tergites and basal angles of third.

Type locality.—Falls Church, Virginia.

Type.—Cat. No. 22862, U.S.N.M.

Described from two females, the type taken June 7, 1914, by William Middleton, and the paratype at the same locality July 4, 1913, by Frederick Knab.

The paratype is slightly smaller than the type, but otherwise practically identical with it.

PRISTOMERUS (PRISTOMERUS) OCELLATUS, new species.

In the female this species is very much like *agilis* (Cresson), but in male the very large ocelli and strongly divergent eyes render it very distinct from any of the described North American species.

Female.—Length, 8 mm.; antennae, 5 mm.; ovipositor, 4 mm.

Head in front view wider than long; face slightly narrower than frons; eyes slightly arcuate opposite antennae, fully a third longer than wide; malar space little more than half as long as basal width of mandible; clypeus subtruncate at apex; lateral ocelli closer to-ether than their greatest diameter; pronotum polished; mesoscutum opaque shagreened, rather densely punctate medially, lateral lobes subpolished; scutellum polished; mesopleurum punctate opaque below, polished above, the oblique impression obliquely striate in anterior end; propodeum punctate dorsally and laterally, transversely rugulose posteriorly, areola narrow pentagonal, costulae at anterior third; hind femur stout; tooth large, not far beyond middle, denticles distinct; longer hind calcarium reaching only one-third length of basitarsus; abdomen polished, postpetiole, second tergite, and base of third striate; second tergite nearly as long as first, twice as long as basal width.

Ferruginous; mandibles, palpi, tegulae, petiole, and apices of second and following tergites yellow; occiput (largely), ocellar triangle, pronotum dorsally, prescutum anteriorly, propodeum basally, postpetiole, second and third tergites largely, and others dorsally blackish or piceous; front and middle legs pale testaceous, their coxae and trochanters stramineous; hind legs darker, coxae, trochanters and femora within, tibiae at base and apex, and tarsi except at base fuscous, femur at apex, tibia in middle and tarsus basally whitish; wings hyaline, veins and stigma black.

Type locality.—Pyziton, Clay County, Alabama.

Other localities.—Langdale, Chambers County, Alabama; Lexington, Kentucky; Marshall Hall, Maryland; North East, Pennsylvania; Lawrence, Kansas.

Type.—Cat. No. 22863, U.S.N.M.

The male differs principally in having the ocelli touching the eyes and the latter very strongly divergent below; the thorax polished and practically impunctate; the hind femur very stout with the large tooth in the middle and the denticles conspicuous.

Described from three females—two from the type locality and one from Langdale, Alabama—all collected by H. H. Smith; and four males, one from each of the last four localities mentioned. The Maryland specimen, which is the allotype, is said to have been reared from stems of *Polymnia uvedalia* infested by the weevil *Rhodobaenus 13-punctatus.*

PRISTOMERUS (PRISTOMERUS) AGILIS (Cresson).

Porizon? agilis Cresson, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 175, female.
Pristomerus euryptychiae Ashmead, Trans. Amer. Ent. Soc., vol. 23, 1896, p. 192.
Pristomeridia agilis (Cresson) Ashmead, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 100.

The types of both Cresson's and Ashmead's names are in the United States National Museum, the latter without the abdomen. In addition there are many specimens of both sexes ranging from Texas and Kansas through Alabama, Kentucky, West Virginia, District of Columbia, Maryland, and Massachusetts. The position of the femoral tooth varies with size, the smaller the tooth the nearer to the apex. In no case except in the male, is it nearly at the middle. There is considerable variation also in the length of the ovipositor and the relative length and width of the second tergite.

Many of the specimens have been reared by A. B. Gahan at College Park, Maryland, probably from *Acrobasis caryae;* by S. W. Bilsing, at College Station, Texas, from *Acrobasis caryaevorella;* by J. D.

Mitchell at Victoria, Texas, from pecan probably on an *Acrobasis* species; at Dallas, Texas, under Hunter No. 1486; and in Massachusetts from lepidopterous larvae on cranberry. Ashmead's type was reared from *Euryptchia saligneana* in District of Columbia.

PRISTOMERUS (PRISTOMERUS) MINUTUS, new species.

Female.—Length, 4 mm.; antennae, 3 mm.; ovipositor, 2 mm.

Much smaller than *agilis* and differing otherwise principally by the key characters. Compared with the above description of *ocellatus* differs as follows: eyes broader, not a third longer than wide; malar space nearly as long as basal width of mandible; clypeus rounded at apex; diameter of lateral ocellus and postocellar line subequal; mesoscutum subpolished and densely punctate throughout; mesopleurum polished, punctate below, the striation perpendicular; areola broad; hind femur hardly stout, tooth very small and far beyond middle, denticles absent; second tergite distinctly shorter than first, nearly three times as long as wide at base; third not striate at base.

Head piceous, orbits ferruginous; clypeus, mandibles, and scape and pedicel yellowish; thorax, including propodeum, largely piceous, pronotum, mesoscutum, and scutellum ferruginous; wings hyaline, venation brown; legs stramineous, hind femur dull testaceous, tibia fuscous at base and apex, tarsal joints fuscous, pale at base; abdomen largely reddish piceous, paler at sides.

Type locality.—Los Angeles County, California.

Type.—Cat. No. 22864, U.S.N.M.

Described from one female reared by D. W. Coquillett from a cecidomyid gall on juniper.

Subgenus NEOPRISTOMERUS Viereck.

Neopristomerus VIERECK, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 592.

PRISTOMERUS (NEOPRISTOMERUS) MELLEUS, new species.

Female.—Length, 6 mm.; antennae, 4.5 mm.; ovipositor, 2.5 mm.

Head broader than long; face slightly narrower than frons, polished, sparsely punctate; clypeus strongly rounded at apex, malar space slightly longer than basal width of mandible, ocelli distinctly narrower than either ocell-ocular or postocellar line; temples convex, opaque, as is also the vertex; mesoscutum opaque, coarsely punctate; pronotum polished, punctate in lower angle; mesopleura, metapleura, and propodeum punctate, last striate posteriorly; areola hexagonal, slightly more than one and one-half times as long as wide, costulae at about anterior two-fifths; stigma rather narrow, barely half as wide as long; hind femur slender, tooth at apical third, denticles obsolete, longer calcarium more than a third as long as basitarsus; abdomen polished; second tergite much shorter than first, about two and one-half times as long as wide at base, only slightly wider at apex.

Body pale fulvous with small dark markings on occiput and on tergites beyond first; legs stramineous, hind femur slightly testaceous, tibia at base and apex and tarsus fuscous; wings hyaline.

Male.—Differs from female practically only by the secondary sexual characters of more slender abdomen and stouter hind femur with larger tooth placed nearer the middle and distinct denticles. The ocelli are not noticeably larger than in female.

Type locality.—Washington, District of Columbia.

Other localities.—Raleigh, North Carolina (allotype) and Columbia, South Carolina.

Type.—Cat. No. 22865, U.S.N.M.

Described from one female and two males. The allotype was received from Gerald McCarthy and reared from a *Gelechia* on tobacco under Bureau of Entomology No. 70880; and the paratype by P. Luginbill from *Elasmopalpus lignosellus*, under Webster No. 9742.

The paratype is brighter in color throughout and the legs testaceous rather than stramineous.

PRISTOMERUS (NEOPRISTOMERUS) APPALACHIANUS Viereck.

Pristomerus appalachianus VIERECK, Trans. Kans. Acad. Sci., vol. 19, 1903–1904, p. 298, female, male.

Pristomerus texanus ASHMEAD, in Sanderson, Bur. Ent. Bull. 57, 1906, p. 36 (*nomen nudum*).

Neopristomerus appalachianus (VIERECK), Proc. U. S. Nat. Mus., vol. 43, 1912, p. 592.

This species is represented in the national collection by a considerable series, mostly of the variety *dorsocastaneus* Viereck, from Kansas, Oklahoma, Texas, New Mexico, and Louisiana. It is reared from such hosts as *Prodenia* species, *Caradrina exigua*, *Loxostege* species, and *Laphygma frugiperda*. There is considerable variation in size and color.

The variety *dorsocastaneus* was described in the same paper as the typical form and transferred to *Neopristomerus* also in the same paper.

OLIGOTMEMA, new genus.

The following description is based only on the female, the male being unknown. Has somewhat the appearance of a small Hemiteline and also of *Canidia* in the Campoplegini; but the very short basal abscissa of radiella, separated clypeus, and closed areola indicate its Cremastine affinities. In the very short radial cell it resembles the Porizonini, but the angle of the radius is not acute, the apical abscissa of radius curves forward toward the metacarpus, the basal vein is not thickened at its stigmal end, and the ovipositor is straight or slightly decurved.

From all the other genera here referred to the Cremastini it differs in the form of the abdomen. This is short, deep, and broad, broadest at apex of second tergite, which is beyond the middle of the abdomen whence it narrows rapidly to the acute apex, the dorsal surface being largely composed of three tergites, the others much retracted. From most of the genera it differs in the possession of an areolet, which is large and in form nearly like that of *Mesochorus*.

Form short and thick, with abdomen barely as long as head and thorax together; antennae nearly as long as body; head, thorax, and propodeum opaque; palpi normal; propodeum short, precipitous behind, hardly extending over hind coxae; wings ample, broad; stigma broad, radius originating beyond middle; radial cell short, not longer on metacarpus than stigma, radial angle slightly obtuse, second abscissa of radius curving slightly forward at distal end; areolet large quadrate, second intercubitus somewhat longer than other three sides, which are subequal; second discoidal cell very short and broad; nervulus interstitial; nervellus perpendicular, weakly broken below middle; abdomen polished; petiole wider than thick, with distinct lateral foveae, edges of tergite distant, not enclosing sternite; postpetiole flattened, several times broader than thick; spiracles at apical two-fifths of segment; second tergite much broader at apex than at base, gastrocoeli indistinct, spiracles before middle; legs long, hind femur reaching nearly to apex of abdomen, femora and tibiae stout, tarsi slender.

Type.—Oligotmema prima Cushman.

OLIGOTMEMA PRIMA, new species.

Female.—Length, 4 mm.; antennae, 3 mm.; front wing, 3 mm.

Head transverse, temples convexly receding; occiput shallowly concave; eyes straight and parallel within, as long as width of face; diameter of ocellus half as long as postocellar line, which equals ocellocular line; entire head including clypeus and temples opaque; clypeus strongly convex and strongly rounded at apex; malar space nearly as broad as basal width of mandible; teeth of mandible equal in length; pronotum obliquely striate below; mesoscutum as wide as long, opaque with minute separated punctures; scutellum sculptured like mesoscutum; thorax laterally and propodeum more strongly punctured; areola as wide as long; petiolar area occupying more than half the length of propodeum, transversely striato-

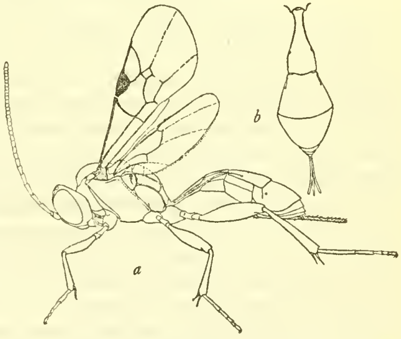

FIG. 1.—OLIGOTMEMA PRIMA CUSHMAN. (*a*) LATERAL VIEW. (*b*) DORSAL VIEW OF ABDOMEN.

punctate; postpetiole and second tergite at base obsoletely, longitudinally aciculate; first tergite much longer than second, which is slightly longer than third; remaining tergites together much shorter than third; ovipositor sheath barely as long as first tergite.

Black; antennae dark brown, paler beneath toward base; mandibles, palpi, tegulae, and front and middle coxae pale brownish; hind coxae and tarsi darker; legs otherwise testaceous; wings hyaline, venation of front wing dark brown, that of hind wing pale brown; abdomen piceous black, tergites narrowly paler at apex.

Type locality.—Colorado.

Type.—Cat. No. 22866, U.S.N.M.

Described from three females collected by C. F. Baker.

Genus CREMASTUS Gravenhorst.

Subgenus CREMASTUS Gravenhorst.

CREMASTUS FERRUGINEUS Davis.

Cremastus ferrugineus DAVIS, Trans. Amer. Ent. Soc., vol. 24, 1897, p. 364, female.

The type of this species runs in my key to females to *graciliventris* Cushman, but differs from that species as follows: Lateral ocellar, postocellar, and ocell-ocular lines in ratio of 1 : 2 : 1, ocelli 1; occipital and ocellar black spots confluent, latter extended down front to base of antennae; a V-shaped spot, with base at middle of propodeum and a branch each side of scutellum black; wings hyaline.

This species was tabulated in the earlier paper, but the specimen used in keying out the species was evidently incorrectly determined.

CREMASTUS BREVINERVIS, new species.

Female.—Length, 4 mm.; antennae, 2.5 mm.; ovipositor, 1.5 mm.

Runs in my key to females to *cookii* Weed, from which it differs as follows: Somewhat smaller; head from above with temples less strongly rounded, from in front nearly transversely oval; malar space barely half as long as basal width of mandible; clypeus strongly convex; antennae shorter, reaching only to apex of first tergite; diameter of lateral ocellus much shorter than ocell-ocular line; thorax with very fine, dense punctuation; wings with veins beyond second recurrent practically erased; metacarpus shorter than stigma; second discoidal cell very short, the second recurrent much more than half as long as first abscissa of subdiscoideus; second tergite only very finely and inconspicuously striate.

Black; orbital rings complete except for short interruption at top of eye; cheeks, malar space, clypeus, and mandibles yellow; scape and pedicel but not basal joints of flagellum yellow below; legs as a whole darker, but coxae not at all black at base; front and middle coxae and trochanters white, hind pair red; hind femur at apex and tibia, as well as middle tibia, beneath fuscous; all tarsi white, apical joint fuscous; wing veins and stigma fuscous; first tergite rufous, others blackish with lateral and apical margins more or less yellow.

Type locality.—Globe, Arizona.

Type.—Cat. No. 22148, U.S.N.M.

One specimen taken on *Thurberia thespesioides* by C. H. T. Townsend.

CREMASTUS BRUNEICEPS, new species.

Female.—Length, 6 mm.; antennae, 4 mm.; ovipositor, 2 mm. Runs in my key to females to *platynotae* Cushman and agrees with all key characters, but differs from that species as follows: Eyes very slightly convergent below; clypeus less strongly convex and rather broadly rounded at apex; face opaque; diameter of ocelli fully two-thirds as long as postocellar line; pronotum laterally shining, finely regulose; petiolar area densely, transversely regulose; second tergite distinctly more than four times as long as wide at base.

Head brownish, without distinct markings; scape, pedicel, and basal joint of flagellum pale below; thorax entirely ferruginous; propodeum with a dusky spot in basal middle; legs as in *platynotae*, except that the contrast in color of coxae and trochanters and femora is less; abdomen largely ferruginous, tergites except first more or less fuscous.

Type locality.—Washington, District of Columbia.

Type.—Cat No. 22149, U.S.N.M.

One female taken by H. L. Viereck, July 2, 1910.

Subgenus ZALEPTOPYGUS Viereck.

CREMASTUS (ZALEPTOPYGUS) ALBIPENNIS (Cresson).

Porizon albipennis Cresson, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 287, female.

In my key to females the type runs to *bilineatus* Cushman, but is at once distinguishable by its shorter ovipositor. Cresson states that the ovipositor is longer than the abdomen, but that portion of it that is exserted, which is the portion considered in the key, is much shorter. It looks more like *viereckii* Cockerell, and may be the female of that species, though it differs somewhat in the color of the abdomen.

CREMASTUS (ZALEPTOPYGUS) ACICULATUS Davis.

Cremastus aciculatus Davis, Trans. Amer. Ent. Soc., vol. 24, 1897, p. 364, male.

This species runs in my key to males to *retiniae* (Cresson), but, as indicated by the original description, is much more contrastingly colored, the thorax generally black with the pronotum red. In this character it is more closely allied to *rosae* Cushman and *plesius* Cushman, both of which are known only in the female, and is very possibly the male of one of these.

CREMASTUS (ZALEPTOPYGUS) GRANULATUS Davis.

Cremastus granulatus DAVIS, Trans. Amer. Ent. Soc., vol. 24, 1897, p. 365, female, male.

In the type series of this species, consisting of four females and one male, there are apparently three species confused. The female bearing the name label and further labeled "Ag. Coll. Mich., 6.8.92-209," is hereby designated as the holotype. This specimen runs in the key to *similis* Cushman and differs from the description of that species only in the second tergite not being parallel-sided but slightly divergent, and in the abdomen being entirely black. Comparison of the types would undoubtedly show other differences.

CREMASTUS (ZALEPTOPYGUS) NEMORALIS Davis.

Cremastus nemoralis DAVIS, Trans. Amer. Ent. Soc., vol. 24, 1897, p. 364, female, male.

In my key to females the type runs to the second alternate of couplet 20 on account of its nearly black hind coxae, but it is really more closely allied to the group of species under the first alternate. In this placing it runs on most of the characters to *similis* Cushman, from which it differs as follows: Petiolar area much broader than areola, latter distinctly more than half as broad as long; first tergite longer than second; second tergite broader, sides weakly divergent; ovipositor longer than abdomen; abdomen black throughout; scutellum black; hind legs mostly dark, coxae and femora piceous, tibiae and tarsi fuscous, trochanters, apices of coxae, and base and apex of femur whitish.

The male runs to the second alternate of couplet 9, but is more closely allied to the species falling under the first alternate, where it agrees best with *tetralophae* Cushman. Differs from female in having scutellum more or less reddish; yellow color of pronotum extending into notauli; middle tergites somewhat reddish; eyes and ocelli larger but not extremely large; diameter of lateral ocellus equal to postocellar line, which is a half longer than ocell-ocular line; face entirely yellow.

CREMASTUS (ZALEPTOPYGUS) ORBUS (Davis).

Leptopygus orbus DAVIS, Trans. Amer. Ent. Soc., vol. 24, 1897, p. 365, female, male.

Both sexes run in my key to *obereae* Viereck, differing in the key characters only in having the wings hyaline.

The two following new species are remarkable for the very short, stout thorax with the mesoscutum broader than long and the areola hardly half as long as the petiolar area. On these characters and the pectinate claws they run in Szepligeti's key[1] to *Celor* Semenow, but differ in having the scutellum flat without lateral carinae and not declivous behind, the areola hexagonal rather than quadrate, and the sixth tergite not excised. In my key to females both run out at couplet 25, but agree with neither alternate, but better with *tetralophae* Cushman. From the key characters applying to that species both differ in having the ovipositor sheath much less than twice as long as the first tergite.

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[1] Gen. Ins., fasc. 34, 1905, p. 49.

CREMASTUS (ZALEPTOPYGUS) OBESUS, new species.

Female.—Length, 5.25 mm.; antennae, 4 mm.; ovipositor, 2.5 mm. Head from above fully twice as broad as long, with temples narrow, weakly convex, and sharply sloping, from in front but little wider than long; eyes large, much longer than width of face, parallel within; diameter of lateral ocellus equal to ocell-ocular line; malar space scarcely half as long as basal with of mandible; clypeus strongly arched basally, broadly rounded at apex, weakly convex; head minutely shagreened, interspersed on face with scattered minute punctures; thorax very short and stout, sculpture fine shagreening interspersed with minute punctures; mesoscutum wider than long. notauli weak except anteriorly; scutellum flat; propodeum short, steeply declivous nearly from base, shagreened, petiolar area transversely striate; areola hexagonal, nearly as broad as long, barely half as long as petiolar area; legs slender, longer spur of hind tibia reaching beyond middle of basitarsus; claws pectinate; wings broad, basal vein and second abscissa of radius straight; discocubital cell hardly a half longer than basal vein, second recurrent distinctly more than half as long as basal abscissa of subdiscoideus; compressed portion of abdomen fully a fourth as deep as entire length of abdomen; first tergite comprising distinctly more than a third of the total length and distinctly longer than dorsal length of propodeum, dorsolateral carina distinct from spiracle to base, postpetiole very finely striate; second tergite but very little more than half as long as first, slightly more than twice as long as basal width, finely longitudinally striate; third tergite striate at base, otherwise, together with remaining tergites, shining; ovipositor sheath distinctly more than a half longer than first tergite.

Dark ferruginous; occiput, vertex, and frons blackish; inner orbit above antenna, lower cheek, mandibles, and clypeus yellow; antennae black, paler toward base especially beneath; pronotum and scutellum slightly paler than surrounding areas; legs pale testaceous, front and middle coxae and trochanters stramineous; hind tibiae infuscate especially at apex; hind and middle tarsi white, darker at apex; tibial spurs white; wings hyaline, veins and stigma dark brown; postpetiole, second tergite largely, and third at base brownish, postpetiole and second tergite yellowish at apex.

Type locality.—Hyattsville, Maryland.

Type.—Cat. No. 22150, U.S.N.M.

Described from two females collected September 1, 1912, by J. R. Malloch.

The paratype differs in lacking entirely the black on the head and in having all the tergites more or less brownish.

CREMASTUS (ZALEPTOPYGUS) LATITHORAX, new species.

Female.—Length, 5.25 mm.; antennae, 4 mm.; ovipositor, 1.5 mm.

Of same size and form as *obesus*, but at once distinguishable by the shorter ovipositor, and differing from that species only as follows: Diameter of lateral ocellus slightly shorter than ocell-ocular line; petiolar area not striate; second recurrent vein barely longer than first abscissa of subdiscoideus; second tergite distinctly more than half as long as first; ovipositor sheath barely a half longer than first tergite.

Paler throughout; head less contrastingly colored, the black replaced by fuscous; antennae brown; venation light brown.

Type locality.—Sabinal, Texas.

Type.—Cat. No. 22151, U.S.N.M.

One female collected by F. C. Pratt and labeled "Hunter No. 2106."

CREMASTUS (ZALEPTOPYGUS) ATTENUATUS, new species.

Chiefly remarkable for its extreme slenderness, being reminiscent in this respect of the genus *Eiphosoma* Cresson, and for the fact that the first tergite completely encircles the petiole. In the latter character it resembles *anomalus* Cushman, to which the female runs in my key on most of the characters. The male of the latter species is unknown and the male of *attenuatus* runs on most of the characters to *bilineatus* Cushman, from which it differs in the petiolar character, habitus, and color of the abdomen.

Female.—Length, 12 mm.; antennae, 8 mm.; ovipositor, 2 mm.

Head barely as wide as thorax, very narrow behind eyes, temples weakly convex; diameter of lateral ocellus subequal to ocell-ocular line, which is barely half as long as postocellar line; face and frons very finely, densely punctate, the former with a minute polished tubercle above; malar space as long as basal width of mandible; clypeus convex, broadly rounded at apex, nearly as long as interfoveal line; thorax and propodeum minutely, densely punctate, thorax laterally and propodeum entirely clothed with long, dense, silvery pubescence; scutellum weakly carinate laterally; propodeum arcuate from base to apex, extending only a short distance beyond base of coxae, insertion of petiole far down between coxae, petiolar area much longer than areolet, latter much longer than wide, distinctly separated from petiolar area; legs very slender; stigma less than half as wide as long, but with radius distinctly beyond middle;

apical abscissa of radius sinuate; intercubitus oblique, upper end beyond lower, radius thickened at its point of junction, recurrent slightly beyond intercubitus, distinctly more than half as long as first abscissa of subdiscoideus; nervulus slightly antefurcal; nervellus strongly antefurcal, broken very close to submediella; abdomen very slender, first and second tergites subequal in length and together as long as rest of abdomen; first tergite polished, completely encircling petiole, postpetiole nearly twice as long as wide; second tergite about six times as long as basal width, inconspicuously striate medially, polished laterally; third tergite polished, gradually compressed toward apex; other tergites strongly compressed; ovipositor sheath barely as long as first tergite.

Black; nearly complete orbital rings, clypeus, mandibles, cheeks, tegulae, all coxae apically, trochanters more or less, front and middle femora in front and at apex, dorsal stripe on hind tibia, and tarsi basally yellow; coxae and basal joint of hind trochanters piceous at base, hind coxae largely so; hind tibiae, except dorsal stripe, piceous; scutellum and spot on each side of prescutum rufous; wings slightly stained; abdomen rufous, piceous at apex, second and third tergites blackish at base.

Male.—Very similar to female, but differing as follows: Malar space shorter than basal width of mandible; ocell-ocular line scarcely half as long as diameter of lateral ocellus; prescutal and scutellar spots yellow.

Type locality.—Victoria, Texas.

Type.—Cat. No. 22152, U.S.N.M.

One specimen of each sex collected May 8, 1911, on *Stillingia sylvatica* by J. D. Mitchell.

CREMASTUS (ZALEPTOPYGUS) DORCASCHEMAE, new species.

Except that the abdomen is not distinctly red beyond the second tergite, but rather piceous, this species runs in the female to couplet 29 in my key and the male to *obereae* Viereck. The female differs from both of the species under couplet 29 in being normal with respect to all three of the subgeneric characters, in having the temples broad and strongly rounded, and the second tergite hardly three times as long as basal width. The male differs from *obereae,* in addition to the color of the abdomen, in having the wings hyaline and by other characters. In the color of the wings it agrees with *orbus* (Davis), from which the abdominal color will distinguish it.

Female.—Length, 7 mm.; antennae, 6 mm.; ovipositor, 3 mm.

Head from above more than half as long as wide, temples, vertex, and cheeks subbuccate; face slightly wider than frons, densely shining pubescent; clypeus barely half as long as interfoveal line, broadly rounded at apex; malar space slightly shorter than basal width of mandible; orbits swollen above antennae; diameter of lateral ocellus equal to ocell-ocular line and one-half postocellar line; thorax and propodeum opaque shagreened, the shagreening interspersed with small punctures, denser and coarser laterally and on propodeum; lateral impression of mesopleurum polished above, striate below; areola pentagonal, nearly equal in length to the petiolar area, the costulae near anterior end; basal median area long triangular, more than half as long as areola; petiolar area transversely rugulose; stigma barely half as wide as long, the radius just beyond the middle; apical abscissa of radius straight, twice as long as basal; second recurrent slightly beyond intercubitus, more than half as long as basal abscissa of subdiscoideus, latter at upper third of apex of second discoidal cell; nervellus antefurcal, broken very near base; legs slender; abdomen with first two tergites longitudinally striate, others shagreened; first tergite no longer than dorsal length of propodeum; second somewhat shorter than first, hardly three times as long as basal width; ovipositor about as long as first three tergites.

Black, tergites beyond second piceous, narrowly reddish at apex, especially above; orbits, with narrow interruptions opposite ocelli and in malar space, cheeks, mandibles at base, clypeus, median spot on face, scape, and pedicel beneath, and apices of flagellar joints yellow; wing base, costa, and streak on costal margin of stigma whitish; wings hyaline, venation, except as noted, dark brown; front and middle legs stramineous with coxae and trochanters in front white, tibiae and tarsi more or less fusco-testaceous; hind coxae and trochanters piceous, apices whitish; femur fusco-testaceous with a white spot exteriorly at apex; tibia and tarsus fuscous, calcaria white.

Male.—Length, 10 mm.; antennae, 8 mm.

The allotype is much larger than the type female, and differs otherwise principally as follows: Ocelli distinctly longer than ocell-ocular line and equal to postocellar line, which is not nearly twice as long as ocell-ocular line; malar space barely half as long as basal width of mandible; apex of clypeus black; face without median yellow spot; antennae black with only apices, of scape, pedicel, and flagellar joints yellow; propodeal carinae very strong and high; hind coxae testaceous, piceous at extreme base, their trochanters and femora also paler than in female, tibiae and tarsi nearly black.

Host.—Dorcaschema nigrum Say.

Type locality.—Syracuse, New York (?).

Type.—Cat. No. 22153, U.S.N.M.

Described from one specimen of each sex reared by M. W. Blackman at Syracuse, New York, from hickory infested by the host and other species of Coleoptera, the cocoons being found in the pupal cells of *Dorcaschema nigrum.* The type is labeled "H-88," and the allotype "H-583."

Family BRACONIDAE.

BASSUS ACROBASIDIS, new species.

Female.—Length, 6 mm.; ovipositor, 4 mm.

Head polished, impunctate, in front view wider by the width of one eye than long; face nearly a half wider than greatest diameter of eye, rather densely pilose; eyes parallel within; malar space two-thirds as long as eye; clypeus truncate, labrum exposed to about the length of clypeus; thorax polished, pilose, especially on pleura and propodeum; posterior margins of pronotum and mesopleurum and metapleural furrow foveolate; notauli weak anteriorly, but deep for a short distance before their junction; fovea between scutellum and mesoscutum finely foveolate; legs stout, hind femur more than a third as deep as long; abdomen polished, equal in length to head and thorax together; first tergite as broad at apex as long, with dorsal carinae strong and parallel basally, becoming obsolete and divergent toward apex, the segment longitudinally rugulose beyond middle, polished medially at apex; second tergite with deep transverse gastrocoeli, longitudinally aciculate at sides; sutüriform articulation, apex of third tergite, and groove across fourth tergite finely foveolate; ovipositor two-thirds as long as body.

Head, antennae, front and middle legs, and thorax except pronotum, metapleura, and propodeum black; (the red pronotum is very unusual in the group to which this species belongs and in this case is probably due to immaturity)[1]; excepted portions of thorax, hind legs (except apices of tibiae and tarsi, which are black), and abdomen red; wings dark infumate.

Male.—Practically identical with female but normal in thoracic coloration.

As is usual in this genus there is great variation in sculpture. All the furrows and sutures mentioned above as foveolate vary from strongly so to practically smooth. This is especially true of those on the abdomen. The propodeum varies from practically smooth with sparse punctures to strongly, irregularly rugulose, the rugae sometimes arranged to form rather distinct areolation. The hind tibia in the male is sometimes very largely fuscous, paler in the middle and at base.

Host.—Acrobasis, species on pecan; *Acrobasis caryaevorella.*

Type locality.—Brownwood, Texas.

Other localities.—Pecan Bayou, Glen Rose, and College Station, Texas.

Type.—Cat. No. 22867, U.S.N.M.

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[1] Since this description was written more specimens have been received from both Mr. Bilsing and Mr. Fabis. Of the 13 new specimens only one female has the pronotum red.

Described from one female and seven males. The type, allotype, and paratypes *a–d* were reared from *Acrobasis*, species by A. I. Fabis the type, allotype, and paratype *a* under Quaintance No. 16787; paratypes *b–d* from Pecan Bayou, under Quaintance Nos. 16926 (*a*) and 16929 (*c–d*); paratype *e* from Glen Rose, under Quaintance No. 16859; while paratype *f* was reared by S. W. Bilsing from *Acrobasis caryaevorella* at College Station.

ORGILUS MACULIVENTRIS (Cresson).[1]

Eubadizon maculiventris Cresson, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 178.

In Ashmead's key to the tribe Orgilini runs to *Orgilus* on the first of the two characters under couplet 2 and to *Oresimus* on the other. It is very closely allied to *lateralis* Cresson and *kearfotti* Ashmead. From the former it differs in having the face very sparsely and weakly punctate; the propodeum less densely punctate, the punctuation not having the appearance of deep reticulation; the abdomen opaque granulate but impunctate; the first tergite fully two-thirds as broad at apex as long; the second tergite much broader at base than long medially; in being entirely ferruginous; and in having the ovipositor as long as the body. From *kearfotti*, which is known only from the unique type, it differs in the broader first and second tergites and in the abdominal sculpture.

Female.—Length, 4 mm.; ovipositor, 4 mm.

Face polished, sparsely, weakly punctate, a third wider than greatest diameter of eye; thorax polished, mesoscutum obscurely, sparsely punctate, densely and coarsely punctate at junction of notauli; longitudinal furrow of mesopleurum strongly ~-shaped, weakly foveolate; propodeum opaque granulate at sides, coarsely and rather densely punctate in middle; longer spur of hind tibia more than half as long as basitarsus; first abscissa of radius much shorter than intercubitus, second abscissa forming a distinct angle with intercubitus; stub of third abscissa of cubitus very short; nervulus postfurcal by half its length; subdiscoideus at basal third of apical abscissa of discoideus; abdomen largely opaque granulate; first tergite about two-thirds as wide at apex as long; second much broader at base than long; ovipositor as long as body.

Pale ferruginous; ocellar triangle black; legs stramineous, hind legs slightly testaceous; apex of hind femur black; tibia fuscous, paler in middle and with a broad white basal annulus, calcaria white; tarsi black; wings hyaline.

Host.—*Acrobasis*, species.

One female, reared June 15, 1918, under Quaintance No. 16784 by A. I. Fabis, at Brownwood, Texas.

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[1] In the manuscript as originally submitted this species was described as new under another name from a single female. The subsequent receipt of another female and a male from the same source proves it to be Cresson's species. Since the sexes differ so markedly in color, the description is not withdrawn

ORGILUS GELECHIAEVORA, new species.

Related to *maculiventris* (Cresson) and differing principally as follows.

Female.—Length, 3.5 mm.; ovipositor, 2.5 mm.

Face granularly opaque, scarcely a fourth wider than length of eye; pronotum irregularly roughened; furrow of mesopleurum weakly curved; metapleurum opaque coriaceous; propodeum irregularly, transversely rugulose, with a distinct, medially interrupted apical carina; apical abscissa of radius and intercubitus forming a nearly straight line; stub of cubitus fully as long as second abscissa; nervulus postfurcal by less than half its length; abdomen about as in *maculiventris;* ovipositor shorter than body.

Bright ferruginous; ocellar triangle not black; legs testaceous, trochanters paler, tarsi and apices of hind femur and tibia fuscous; wings very slightly infumate.

Host.—*Gelechia trialbamaculella* Chambers.

Type locality.—Whitesbog, New Jersey.

Type.—Cat. No. 22869, U.S.N.M.

One female reared July 12, 1916, under Quaintance No. 12789, by H. B. Scammell.

HABROBRACON GELECHIAE (Ashmead).

Since my revision of this genus was published[1] I have reared a large number of specimens of *gelechiae* from the grape berry moth. These show variation from the broad abdomen of the type to the tapering abdomen of *johanniseni* Viereck. They agree further with the type in the color of the legs and in the male in color of abdomen. The last constitutes the only apparently constant character that I have been able to discover, and were it not for this I would be inclined to synonymize the two species.

HABROBRACON ERUCARUM, new species.

In my key to the North American species of *Habrobracon* runs to the last couplet, where it agrees in abdominal characters of the female with *gelechiae* (Ashmead) and in color of male with *johannseni* Viereck. From both it differs in having the scutellum flattened and subpolished, the propodeum with a median longitudinal carina at apex, and in the ovipositor being only about as long as the second tergite (in both *gelechiae* and *johannseni* the ovipositor is about twice as long as the second tergite). The entire body is somewhat more shining than in either of the other species, and the wings are less distinctly clouded with darker venation.

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[1] Proc. Ent. Soc. Wash., vol. 16, 1914, pp. 99–108.

Female.—Length, 2.5 mm.; antennae (broken).

Body shining, granular; scutellum, and apical tergites subpolished, the sculpture weak, former with a few punctures; abdomen broad, rounded at apex; ovipositor subequal in length to second tergite.

Black; upper and lower anterior orbits and mouth brownish; legs blackish with articulations paler; wings only very indistinctly brown-stained, venation very dark brown; abdomen entirely black.

Male.—Much like female; abdomen rather broader than usual.

Host.—*Euxoa*, species.

Type locality.—Vernal, Utah.

Type.—Cat. No. 22870, U.S.N.M.

One female and three males reared by S. J. Snow on June 7 and 19, 1916, under Webster No. 16615. The type, allotype, and paratype *a* also bear the cage No. 2026 I.A, while paratype *b* is labeled 2026 A.B.U. In the allotype, the only specimen having an entire antenna, this is rather stout filiform and 25-jointed.

(TRACHYUSA) HABROBRACON AMERICANA (Ashmead) Gahan.

In my key to North American species runs to couplet 5, but differs from the two species falling there and from *erucarum* Cushman described above in having the malar space very long and the cheeks perfectly straight, the head in front view having a somewhat Agathidine appearance.

PRELIMINARY DIAGNOSES OF NEW CEPHALOPODS FROM THE WESTERN ATLANTIC.

By S. Stillman Berry,
Of Redlands, California.

The cephalopods, wholly pelagic forms, which were obtained by the United States Coast and Geodetic Survey steamer *Bache* during her cruise in the western North Atlantic in the early months of 1914, were submitted to the writer for study and report by the Bureau of Fisheries. The work was begun at once, but was abruptly interrupted by the circumstances attendant upon the entry and participation of the United States in the World War, and its resumption proved impossible until last year. As it appears that the publication of the final report upon the collection as a whole is likely to be yet further delayed, it seems desirable to publish a preliminary account of such new forms, some of them of considerable intrinsic interest, as have thus far come to light in the course of examination of the material. More detailed descriptions and figures of each species will appear in connection with the ultimate complete report above referred to.

The present figures are from drawings by J. Stanley Ferguson.

CHIROTEUTHOIDES, new genus.

Small, loliginiform oegopsids, having the anterior mantle margin free, the funicular locking cartilages elongate and simple. Body elongate, continued between and past the fins as a minute, needle-like process, probably bearing accessory fins or membranes when entire. Ventral arms greatly developed as in *Chiroteuthis* and allied genera, the third pair the reverse. Arm suckers in two rows throughout.

Type.—Chiroteuthoides hastula, new species.

CHIROTEUTHOIDES HASTULA, new species.

Plate 16, fig. 3.

Diagnosis.—Body more or less cylindrical, narrow, tapering quite suddenly and rapidly just in front of the fins to a minute, needle-like aciculum, consisting mainly of the very attenuate posterior portion of the gladius, which extends between the fins and some distance past them. Fins nearly circular, about one-third as long as the sac-like part of the mantle, strongly indented posteriorly; anterior margins less arcuate than the posterior and scarcely notched; traces of a possible "accessory fin" or membrane evident on the margins of the broken needle-like process described above.

Head small, rounded, much compressed dorso-ventrally. Funnel large, thin walled, inflated, reaching about to the center of the head. Funnel cartilages long and narrow, slightly widest posteriorly, thence tapering to a point in front; their grooves simple. Eyes large. Region of head in front of eyes leading to arms stout, four-angled.

Arms well developed; the fourth pair, which are much the largest and longest, about two-thirds as long as the body (exclusive of fins and needle-like process), strongly keeled and bearing two rows of small suckers for their entire length, the distal ones becoming very minute; dorsal and second arms subequal, about half as long as the ventrals; third arms strongly compressed, keeled, and excessively small, being between one-third and one-half as long as the neighboring second pair. Suckers minute, in two rows throughout.

Tentacle stalks about as thick as the second arms; clubs amputated and their structure hence unknown.

No luminous organs evident.

Total length (exclusive of tentacles), 16.5 mm.; length of mantle (dorsal), 10+mm.

Type.—Cat. No. 338693, U.S.N.M. [S.S.B.637].

Type locality.—200–0 m., station 10187, latitude 28° 59′ N., longitude 69° 22′ W.; February 23, 1914.

Remarks.—The inconspicuous specimen upon which the new genus and species here proposed are founded has proven so difficult to align with any of the described oegopsids that independent treatment has seemed to be unavoidable. Even its family relationships are not altogether certain. In many ways it has quite the aspect of a *Chiroteuthis*, particularly in the enormously developed ventral arms and the extreme posterior attenuation of the conus of the gladius, but the presence of stalked olfactory tubercles is yet to be established, and the funnel cartilages are far from typically chiroteuthoid.

The absurdly minute arms of the third pair are similar to those of no other cephalopod with which I am acquainted.

ENOPTROTEUTHIS, new genus.

Small loliginiform oegopsids having the anterior mantle margin free, the funicular cartilages being somewhat ovate. Body continued posteriorly between the enormous semicircular fins as a long, extremely slender, needlelike process covering the very attenuate cone of the gladius, without accessory fins. Head prolonged in front of the eyes into a squarish snout. Eyes large, on stout stalks. Arms moderate, not strongly dissimilar. Tentacles with a minute club bearing but few suckers (in two rows in present material).

Type.—Enoptroteuthis spinicauda, new species.

ENOPTROTEUTHIS SPINICAUDA, new species.

Plate 16, fig. 6.

Diagnosis.—Body very short, vasiform, swollen just behind the middle, thence tapering abruptly to continue between and past the fins and as far again as a delicate, needlelike process consisting principally of the excessively produced and attenuated posterior prolongation of the cone of the gladius. Fins almost perfectly semicircular, but their anterior and posterior margins a little flattened so that together they form an immense, nearly circular, transverse ellipse, half again as long as the body proper. No evident traces present of an accessory membrane of fin.

Head fairly large, oblong, flattened, produced in front as a long, four-sided, snout-like process leading to the arms. Funnel moderate, the funnel cartilages more or less ovate. Eyes enormous, pushed forward on short, heavy, columnar stalks, composed mainly, it would seem, of the immense optic ganglia.

Arms moderate, the lateral pairs somewhat the longest (perhaps two-thirds as long as the body proper), the formula of relative length being 2, 3, 4, 1, or 2, 3, 4 = 1. Suckers in two rows, quite large in proportion to the arms.

Tentacles about twice as long as the arms, the club minute, not expanded, bearing but four suckers arranged in two rows, the three proximal ones much the largest.

No luminous organs evident.

Total length, about 25 mm.; length of mantle (dorsal), about 17 mm.

Type.—Cat. No. 338694, U.S.N.M. [S.S.B.638].

Type locality.—75–0 m., station 10188, latitude 28° 51′ N., longitude 70° 08′ W.; February 24, 1914.

Remarks.—This extraordinary little squid possesses a combination of very puzzling features. It has a manifest resemblance in its general facies to many of the Chiroteuthidae, and that the relationship is a more than fancied one is indicated by the form of the locking cartilages which does not support its reference to any other family as well. Nevertheless there are discrepancies, as the tentacles show but two rows of suckers on the club, and the ventral arms fail to exhibit the predominance so generally characteristic of these organs in this family. The stalked eyes are also quite peculiar in structure.

Genus TEUTHOWENIA Chun, 1910.

ASCOTEUTHIS, new subgenus.

Cranchiids of moderate size, with strongly inflated mantle, showing evident resemblance to *Teuthowenia* s. s., but differing in the much larger, almost semicircular fins, funnel shorter than the strongly developed eyestalks, and the fact that the first and second arm pairs are distinctly shorter than the third and fourth. The arms and tentacles are well developed, the latter very long, with very minute suckers in four rows on the distal portion. The mouth region is large and strongly protruding.

Type.—*Teuthowenia* (*Ascoteuthis*) *corona*, new species.

TEUTHOWENIA (ASCOTEUTHIS) CORONA, new species.

Plate 16, fig. 7.

Diagnosis.—A moderate-sized cranchiid with an inflated, cask-shaped or bag-shaped body, tapering rapidly to a sharp point between and slightly past the small, more or less semicircular fins. Texture of mantle membranous, fairly tough.

Head inconspicuous, pushing out in front as a stout, columnar snout. Eyes large, rounded, their stalks stout and well developed, when entire considerably longer than the funnel; optic ganglia enormous; ocular photophores difficult to distinguish in material at hand. Funnel large, with a wide aperture; when extended reaching barely past the base of the arms.

Arms well developed, keeled, their formula of relative length manifestly 3, 4, 2, 1; third pair distinctly largest and longest, being about one-fifth as long as the mantle. Suckers small, two-rowed. Umbrella wanting.

Tentacles very long; club distinctly keeled, otherwise not expanded, and bearing four rows of very minute suckers, which continue for an uncertain distance down the stalk.

Buccal region strongly raised and protruding between the arms like a continuation of the snout.

Total length, about 57 mm.; length of mantle (dorsal), 27 mm.; length of fins, 4 mm.

Type.—Cat. No. 338695, U.S.N.M. [S.S.B.618].

Type locality.—100–0 m., station 10173, latitude 32° 27′ N., longitude 68° 22′ W.; February 4, 1914.

Remarks.—This interesting cranchiid is evidently nearer to *Teuthowenia* than it is to any of the other described genera, the differences so far noticed being of such a nature that it is here described as representing a new subgenus of the older group. It has, however, a certain aspect of its own, recalling Chun's remarkable *Crystalloteuthis* in some respects, while the fins are so entirely different from those of the typical *Teuthowenia* both in shape and manner of attachment to the mantle that it is possible that *Ascoteuthis* some day will have to be accorded full generic standing. *Teuthowenia* s. s. is likewise represented in the *Bache* collections, making possible direct comparison of the two.

Genus SANDALOPS Chun, 1906.

SANDALOPS PATHOPSIS, new species.

Plate 16, fig. 1.

Diagnosis.—A minute cranchiid with an elongate, cylindro-conic, almost taoniform body, tapering at first gradually, then more rapidly to a point between the fins. Texture of mantle membranous, the gladius evident as a distinct hyaline streak along the dorsum. Fins minute, each subcircular and about as broad as long; strongly constricted at base, where they are distinctly separated by the hyaline conus.

Head roughly quadrangular, strongly compressed dorso-ventrally; in front passing into a stocky but well-developed columnar snout. Eyes large, strongly constricted just below the oval bulbus; their transparent stalks enormously elongate, the entire apparatus perhaps four times as long as the snout and often grotesquely contorted. A subcircular brownish body nearly covering the ventral end of each bulbus is possibly the photogenic organ. Funnel large, when extended reaching a trifle past the base of the eyestalks.

Arms practically vestigial throughout, bearing hardly more than a single pair of suckers each; ventral arms and their suckers scarcely distinguishable.

Tentacles long, stout; their clubs minute, hardly expanded and only very weakly keeled. Suckers on club small, in four rows, yet relatively few in number owing to the minute dimensions of the club; passing into a two-rowed condition on the carpus, they continue in rather widely spaced pairs to the base of the stalk.

Total length, about 15.5 mm.; length of mantle (dorsal), 8 mm.

Type.—Cat. No. 338696, U.S.N.M. [S.S.B.624].

Type locality.—1100–0 m., Station 10166, latitude 32° 33′ N., longitude 72° 14′ W.; January 30, 1914.

Remarks.—There are six specimens of this most absurd appearing little cephalopod in the collection, all very constant in the characters described. From Chun's strange *S. melancholicus,* the type of the genus, they differ in the conspicuously longer eyestalks, more regularly oval eyes, decidedly elongate and tapering body, and the presence of weak keels on the tentacle clubs. Possibly none is mature.

SANDALOPS ECTHAMBUS, new species.

Plate 16, fig. 2.

Diagnosis.—A cranchiid of small size, with an elongate, more or less inflated, cylindro-conic body, tapering at first gradually, then more rapidly, to a point between the fins. Texture of mantle membranous, the gladius evident as a yellowish streak in the mediodorsal line. Fins rather small, each probably subcircular and about as broad as long; slightly constricted at base; barely separated by the hyaline conus.

Head small, rounded, well elevated dorsally, passing in front into a stocky, slightly tapering snout of only moderate length. Eyes large, distinctly constricted between the large, spherical optic ganglia and the almost spindle-shaped, strongly ventrally produced bulbi; eyestalks quite stout, transparent, larger than and about twice as long as the snout. Ocular photophores not yet certainly identified. Funnel moderately large, reaching just past the base of the eyestalks.

Arms normally developed, but small, the third pair, which are largest, but little longer than the snout; formula of relative length, 3, 4, 2, 1. Suckers small, round, the two rows well separated, but the suckers rather crowded in the row.

Tentacles long and stout, their clubs long, slender, tapering, and not expanded except for a rather wide, delicate, membranous keel on the distal portion. Suckers small, numerous, in four rows on club, whence they pass on the carpus into two zigzag rows which extend perhaps half way down the stalk.

Total length, about 43 mm.; length of mantle (dorsal), 22 mm.

Type.—Cat. No. 338697, U.S.N.M. [S.S.B.627].

Type locality.—100–0 m., Station 10208, North of Little Bahama Bank; March 21, 1914.

Remarks.—This strange cranchiid differs from *S. melancholicus* Chun in the strongly keeled tentacle clubs, more elongate and tapering body, relatively larger fins, and the somewhat different shape of the eyes. From the preceding species it is readily separable by reason of its shorter eyestalks, strong ventral elongation of the bulbi of the eyes, strong keels on the tentacle clubs, and larger fins.

Although the original diagnosis of *Sandalops* has to be considerably modified to permit the reference to it of the two species here described, they appear to show better affinity with this than other cranchiid genera. Indeed one can feel by no means confident that a full ontogenetic series will not show all three of the named forms to be merely developmental stages of a single species. To proceed, however, on such a gratuitous assumption, unsupported by any direct evidence from the specimens themselves, would certainly, in view of the many discrepancies manifested, be very unwise. Separate treatment is obviously the safest plan for the present.

Genus PYRGOPSIS de Rochebrune, 1884.

PYRGOPSIS LEMUR, new species.

Plate 16, fig. 5.

Diagnosis.—A cranchiid of small size, with an elongate, spindle-shaped body, most inflated near the middle, thence tapering to a sharp point between and slightly past the large, nearly semicircular fins. Texture of mantle membranous, the gladius evident as a hyaline streak in the mid-dorsal line; a longitudinal series of cartilaginous tubercles on each side, ventrally, extending back from the points of attachment of the mantle. Fins with anterior and posterior outlines somewhat flattened, but broadly adherent to the tip of the body so that together they form a robust transverse ellipse.

Head small, conical, prolonged in front as a long, columnar, obscurely quadrangular, ventrally flattened snout. Eyes of moderate size, pyriform, projected into a point forward and ventrally, distinctly constricted between the bulbus and the large rounded optic ganglion; eyestalks long, stout, cylindrical, transparent, not quite as long as the snout; bulbus with an oblique series of four small photophores on the inner ventral aspect, and there are possibly others. Funnel long, reaching well past the base of the eyes.

Arms small and slender, their formula of relative length 3, 4 = 2, 1; the third pair fully three times as long as the second and fourth, which to an only less degree than the dorsals are small and weakly developed. Suckers small, in two fairly well-separated rows.

Tentacles long, much stouter and more robust than the arms; their clubs but slightly expanded, keeled, and bearing four rows of suckers, the two median of which on the expanded portion of the club are conspicuously the largest; two rows of suckers, greatly reduced in size, continuing down the distal half or two-thirds of the tentacle stalk.

Total length, 55 mm.; length of mantle (dorsal) 32 mm.

Type.—Cat. No. 338698, U.S.N.M. [S.S.B.582].

Type locality.—Surface, Station 10161, latitude 35° 27′ N., longitude 73° 14′ W., East of Cape Hatteras; January 28, 1914.

Remarks.—This species seems without doubt to be most nearly allied to the Chilean *P. schneehageni* Pfeffer, and may conceivably represent only an Atlantic race of the same stock, but the published descriptions of the latter indicate that certain differences exist. Chief among these are, in the Chilean species, the shorter funnel, not reaching to the base of the eyestalks, the decidedly triangular fins (although their shape as described is no doubt partly due to the conditions of preservation), the alleged distribution of suckers only along the distal third of the distinctly shorter tentacle stalks, and the relatively shorter arms, even the third pair of which is exceeded in length by the snout.

Genus POLYPUS Schneider, 1784.

POLYPUS SCORPIO, new species.

Plate 16, fig. 4.

Diagnosis.—Body small, ovate to pyriform, rounded or rounded-conic behind. Mantle opening ample, extending to a point well back of and just below the level of the pupil.

Head distinctly narrower than the body, but wide and strongly flattened; delimited from the body by a nuchal ridge, and covered by a loose, transparent skin. Eyes large and conspicuous. Funnel large, thick-walled; free only at the tip, which extends barely to the base of the ventral arms.

Arm formula 3, 2, 4, 1; dorsal arms small and slender, about a third shorter than the mantle; ventral arms but little longer; second arm pair about a fourth longer than the mantle and nearly twice as long as the dorsal arms. Third arms more than twice as long as the second pair and much larger and thicker, increasing slightly in diameter from the base to near the middle, thence diminishing gradually until at the tips they taper off quite abruptly; somewhat compressed dorso-ventrally but not keeled. First three or four suckers at base of arms in a single (sometimes weakly zigzag) row; remaining suckers in two rows, large, circular, well elevated. Umbrella thin, delicate; very short, especially between the arms of the dorsal and ventral pairs.

Surface nearly smooth, but dorsal region of body showing a very minute, scattering, granular papillation under sufficient magnification.

Color in alcohol grayish buff, except the eyes, which are dark bluish or slaty, with a golden iridescence around the pupil. Chromatophores few and scattered, the most conspicuous being a single pair near the median line on the head just in front of the nuchal region.

Total length, 22 mm.; length of mantle (dorsal) 4.5 mm.

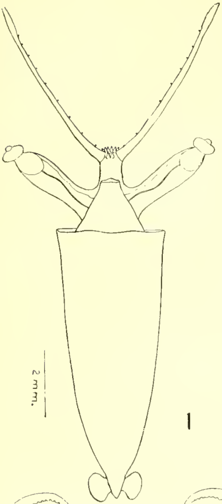
Type.—Cat. No. 338699, U.S.N.M. [S.S.B.682].

Type Locality.—75–0 m., station 10204, off Biscayne Bay, Florida; March 20, 1914.

Remarks.—The only species to which this small but very bizarre little octopus seems at all similar is the *Octopus gracilis* of Verrill (1884). The present specimens differ manifestly from Verrill's description in several particulars, notably the still greater enlargement and lengthening of the third arm pair, the relative shortness of the dorsal arms, and the minute dorsal papillation. Even though they eventually prove to be conspecific, however, it seems safe to apply a new name to the *Bache* species, as that chosen by Verrill was utilized over thirty years previously by Eydoux and Souleyet (1852), although their species is now referred to the genus *Tremoctopus*.

EXPLANATION OF PLATE 16.

Fig. 1. *Sandalops pathopsis.* Ventral aspect of type.
2. *Sandalops ecthambus.* Ventral aspect of type.
3. *Chiroteuthoides hastula.* Ventral aspect of type.
4. *Polypus scorpio.* Ventral aspect of type.
5. *Pyrgopsis lemur.* Ventral aspect of type.
6. *Enoptroteuthis spinicauda.* Ventral aspect of type.
7. *Teuthowenia* (*Ascoteuthis*) *corona.* Ventral aspect of type.



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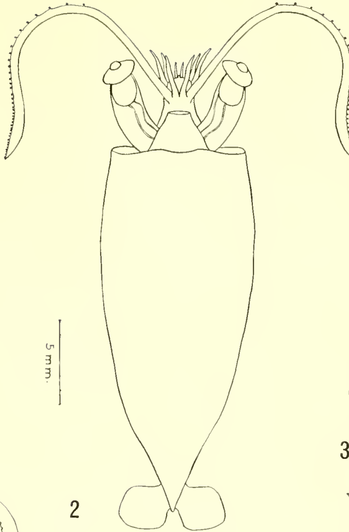

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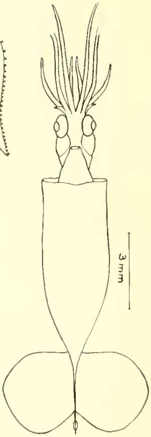

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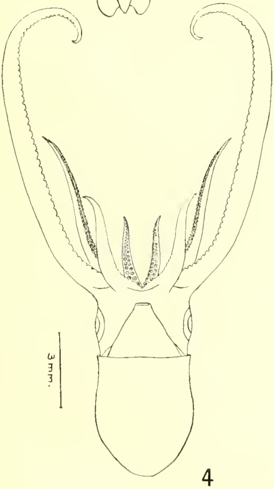

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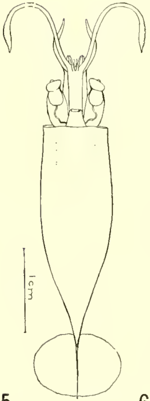

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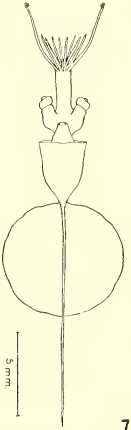

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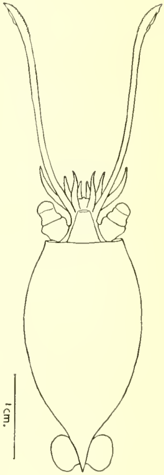

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NEW CEPHALOPODS FROM THE WESTERN ATLANTIC.

FOR EXPLANATION OF PLATE SEE PAGE 300.

NEW FRESH-WATER SHELLS FROM GUATEMALA.

By William B. Marshall.
Assistant Curator, Division of Marine Invertebrates, United States National Museum.

The United States National Museum's rather extensive collection of the genus *Sphaeromelania* has recently been enriched by a fine series of specimens from Guatemala, collected and presented by Mr. Anson A. Hinkley, of Du Bois, Illinois. Among these is one lot of specimens which do not agree with any in the collection nor with any described species so far as I have been able to determine. Knowing that the species of *Sphaeromelania* are subject to great variation, as great, perhaps, as is to be found in the whole molluscan realm, I have been unusually cautious and have carefully considered all the evidence available before coming to the decision that these shells belong to a new species.

The new species of *Cochliopa* here described is very different from any previously known species. The shell of this species so intimately resembles *Valvata* that it would be placed in that genus were it not for the operculum.

SPHAEROMELANIA HINKLEYI, new species.

Plate 17, figs. 4–13.

Shell bulimiform, densely spirally striated, obsoletely malleated. Axial sculpture consisting of numerous fine growth lines, with an occasional rest period accentuated, especially on the body whorl just behind the aperture. Whorls (apical ones lost) apparently about seven, moderately rounded, rapidly enlarging, the body whorl forming about two-thirds of the shell. Suture well impressed. Color nearly uniform, dark chestnut. Aperture pyriform, columellar lip with a heavy deposit of callus, especially at its upper end, deeply sinuate near its lower end, its prevailing color dark purplish brown, pale on its inner edge. Interior of shell pale livid purplish with a vertical blackish stripe near the outer lip. Outer lip simple, margined with blackish.

The type (fig. 6), Cat. No. 336412, U.S.N.M., measures—length, 37.5 mm.; greater diameter, 21.5 mm.; lesser diameter, 19 mm. It and 15 other specimens were presented by Mr. Hinkley, who collected them in the Tsalbha River at Chama, Alta Vera Paz, Guatemala, in February, 1917.

All the specimens of *Sphaeromelania* figured on plate 17 are supposed to be mutations of this species. Figure 11 represents one extreme, in which the shell is larger, more slender, and of thinner texture, while figure 10 represents the other extreme, with short, stout chunky form. Several of the specimens have a faint, broad band of darker color encircling the middle portion of the whorls.

It is a pleasure to name this species in honor of Mr. Hinkley, whose explorations in Mexico and Central America have done much toward increasing our knowledge of the Molluscan fauna of those regions.

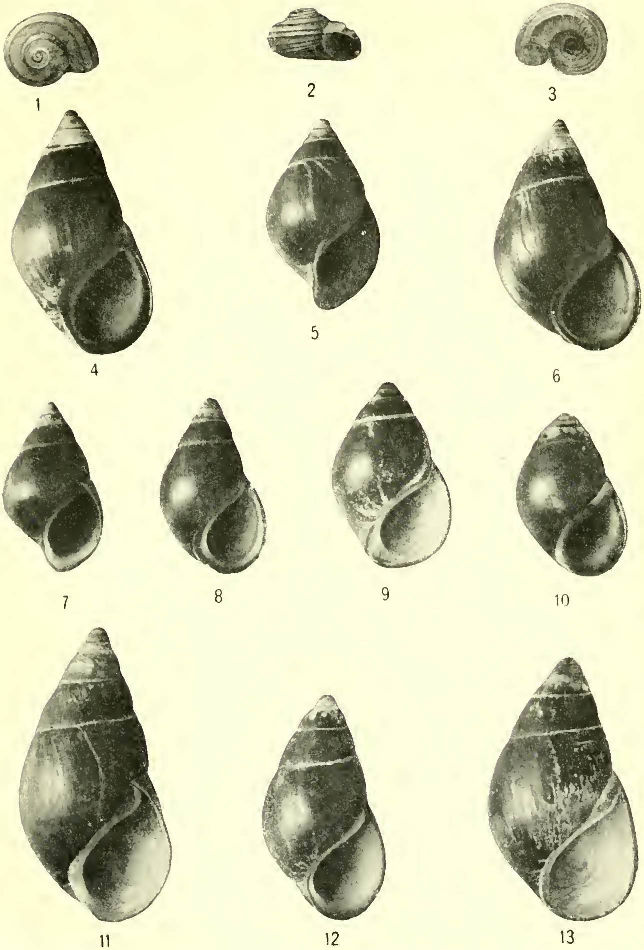
COCHLIOPA DULCENSIS, new species.

Plate 17, figs. 1–3.

Shell valvatiform, depressly, conically turrited. Whorls three and a half, excavately shouldered. Spirally ribbed with seven strong, nearly equal ribs. The first rib is at the shoulder, the third is at the periphery, the seventh marks the circumference of the umbilicus. Near the aperture the last whorl descends from the second to the third rib. Color, greenish horn; ribs reddish chestnut, showing as spiral bands within the aperture. Aperture entire, slightly oblique, subcircular, slightly narrowed at the upper part. Outer lip simple, minutely angled at each rib; columellar lip somewhat expanded and a little thickened within. Principal growth lines well marked on the shoulder, between the ribs and on the base, radiating, set at regular intervals and showing hints of chestnut coloring. Minor growth markings numerous, fine. Umbilicus wide, perspective, somewhat funnel-shaped, showing all the whorls, which appear to be loosely coiled. Operculum corneous, paucispiral, pale yellowish.

The type, Cat. No. 336413, U.S.N.M., measures—altitude, 1.3 mm.; greatest diameter, 3 mm.; least diameter, 2.3 mm. It and nine other specimens were presented by Mr. Anson A. Hinkley, who collected them in January, 1917, in the Dulce River, Guatemala.

The general aspect of this species resembles that of the well-known *Valvata tricarinata*. Viewed from above the two species are almost exact counterparts of each other so far as form and sculpture are concerned. In the living specimens the chestnut coloring of the spiral ribs does not show well against the dull background of the general surface, but in the dead shells the general color bleaches to a yellowish tinge and the dark coloring of the ribs becomes one of the most prominent features of the shell and throws the ribs into sharp relief. Within the aperture the chestnut banding is prominent in living shells, but hardly apparent in the dead specimens. The species is perhaps the most attractive of the *Cochliopas* thus far discovered in Central America. The spiral ribs are subject to some variation in number and strength.



New Fresh-Water Shells from Guatemala.

For explanation of plate see pages 301-302.

SOME RECENT ACCESSIONS TO THE MINERAL COLLECTIONS OF THE UNITED STATES NATIONAL MUSEUM.

By William F. Foshag,

Assistant Curator in charge of Mineral Collections, United States National Museum.

During the last two years the Department of Mineralogy of the United States National Museum has acquired, mainly through gifts, material of especial merit. The specimens listed below do not cover the entire number of exceptional materials presented by friends of the museum, but only some of the very finest. These notes do not contain any new data, but are simply intended to call attention to these exceptional specimens.

One of the most remarkable specimens acquired in recent years is a group of cinnabar crystals (U. S. Nat. Mus. 93261), presented by Mr. Nelson T. Johnson, United States consul at Changsha, China. The locality is Hunan Province, China. Specimens of cinnabar from here have been known for some time, but because of the intermittent working of the mines few specimens have found their way into Europe and the United States. The one obtained by Mr. Nelson is perhaps the finest in the United States. It consists of a mass of crystallized quartz, the crystals ranging up to 3 millimeters. Upon the face of the specimen are eight brilliant, deep red penetration twins of cinnabar averaging over 3 centimeters in size. In the cavities and scattered over other portions of the specimen are a number of smaller ones. The brilliancy of the crystals and their deep red color contrast strongly with the fine drusy background of quartz. The lower figure on plate 18 shows the specimen in natural size.

Hunan has also become famous for its arsenic minerals. Mr. Ralph W. Weymouth presented to the museum several of these, among which was a mass of pure arsenolite (U. S. Nat. Mus. 93432), weighing almost a kilogram. It is a portion of a crust 7 centimeters thick and banded with narrow layers of red. The upper crust is partially covered with a layer of native arsenic.

One of the largest and finest scheelite crystals ever found has been donated to the museum by Mr. J. Morgan Clements.* The locality is Ryudo, Chushihoku Province, Korea. It is a simple pyramidal

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crystal, with the lower portion incomplete where it has been attached to a matrix of quartz crystals, several of which are embedded in the lower portion. The color is smoky brown, similar to the color of many smoky quartz crystals. The edges are exceptionally sharp and the faces bright and lustrous, an exceptional feature for so large a crystal. The upper figure on plate 18 shows the crystal reduced one-fourth.

Among a recent gift of Mr. C. S. Bement is a remarkably large and clear crystal of danburite (U. S. Nat. Mus. 93384) from Obira, Japan. The crystal is 3 centimeters long and 2 centimeters wide, colorless, and transparent. The faces are sharp and brilliant. The prism zone is striated, but the pyramids and domes have a very high polish.

Another gift of Mr. Bement is a large specimen of the variety of vesuvianite known as wiluite from the mouth of the Achtaragda River where it joins the Wilui River in eastern Siberia. The vesuvianite was first found here in 1790, but because of the remoteness of the region specimens in collections are somewhat rare. The perfection of the crystals and the pleasing combination of dark green, highly lustrous crystals, and light gray background make them much sought after. The specimen presented by Mr. Bement (93387) measures 18 by 18 centimeters and shows 15 large, brilliant, and well-formed individuals on one face. The most prominent face is the prism of the second order and they are terminated by the pyramid and base. Through the matrix are scattered small crystals of achtaragdite, showing as triangular cross sections. Plate 19 shows the specimens somewhat reduced.

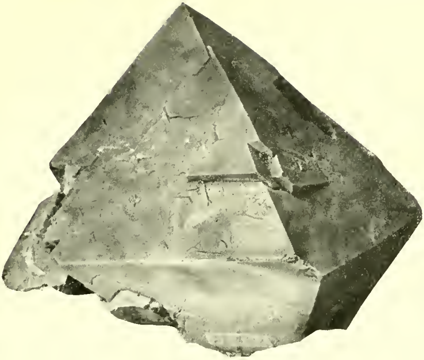
From the same locality as the vesuvianite and occurring in the same tuffaceous rock is a specimen of achtaragdite from Mr. Bement. This mineral is unique in that its form is the tristetrahedron. The only other mineral showing this form alone is helvite, and for this reason achtaragdite is considered pseudomorphous after that mineral. In spite of its uncertain character as a definite species the unusual size and habit of its crystal makes it one of the most interesting of minerals. The specimen recently acquired is a mass of the tuffaceous rock with three well-formed achtaragdites over 3 centimeters in length and a number of smaller ones. They are light gray in color and project prominently from the matrix. The upper figure on plate 20 illustrates the specimen described and shows well the form of the crystals.

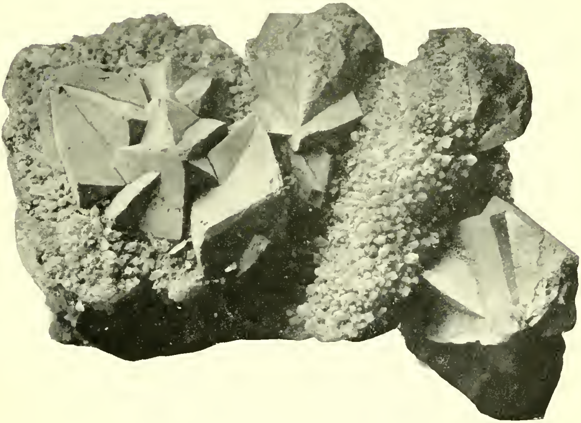
Crystals of zincite are of great rarity, and the museum was fortunate in acquiring by gift from Mr. C. S. Bement a specimen showing six, the largest being over 3 centimeters in length. They are well defined though not brilliant. Coating some of the crystals and lining some of the cavities is the new mineral gageite. The lower figure on plate 20 shows the habit of the crystals.

Still another gift of Mr. Bement is a specimen of friedelite, also from Franklin Furnace (U. S. Nat. Mus. 93391). Scattered over the specimen are clear, glassy willemite crystals of a light green color. They are made up of the hexagonal prism and terminated by the rhombohedron. The friedelite forms rich brown masses attached to the willemite crystals and also as botyroidal coatings over the rock. The ground mass in some places is made up of small, brilliant yellow crystals of garnet. The combination is pleasing and attractive.

Another gift of Mr. Bement is a crystallized specimen of leucophoenicite, consisting of a mass of barite with interspersed crystals of franklinite upon which is a crust of leucophoenicite 4 centimeters in thickness. The surface of a large portion of this crust is covered with brilliant rose red crystals. Coating a portion of the face and also lining cavities and between the plates of barite are masses of felty sussexite of pale pink color. Qualitative tests show that this is the true sussexite and not the calcite zincite mixture so commonly called by that name. The specimen, therefore, is interesting not only crystallographically, but also as an association of these two rare minerals.

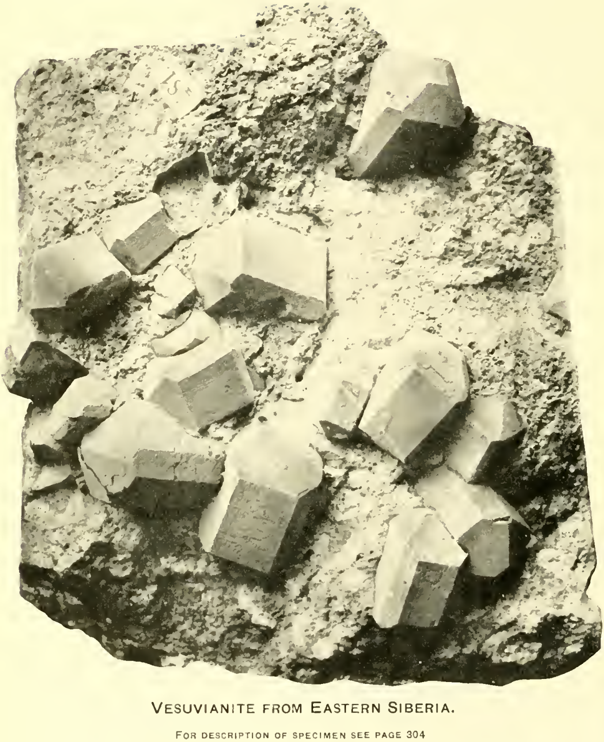
Other specimens deserving mention are the rare carbonate nesquehonite (U. S. Nat. Mus. 93755), the gift of Samuel Gordon; inyoite from Nova Scotia presented by Albert Manufacturing Co., (U. S. Nat. Mus. 93768), a new locality for this mineral; an unusually large twinned quartz crystal from Japan and two unusually large and clear crystals of willemite, and a brilliant cut stone of deep yellow color, weighing 11 carats, of the same material from Franklin Furnace (U. S. Nat. Mus. 93389), from Mr. Bement.





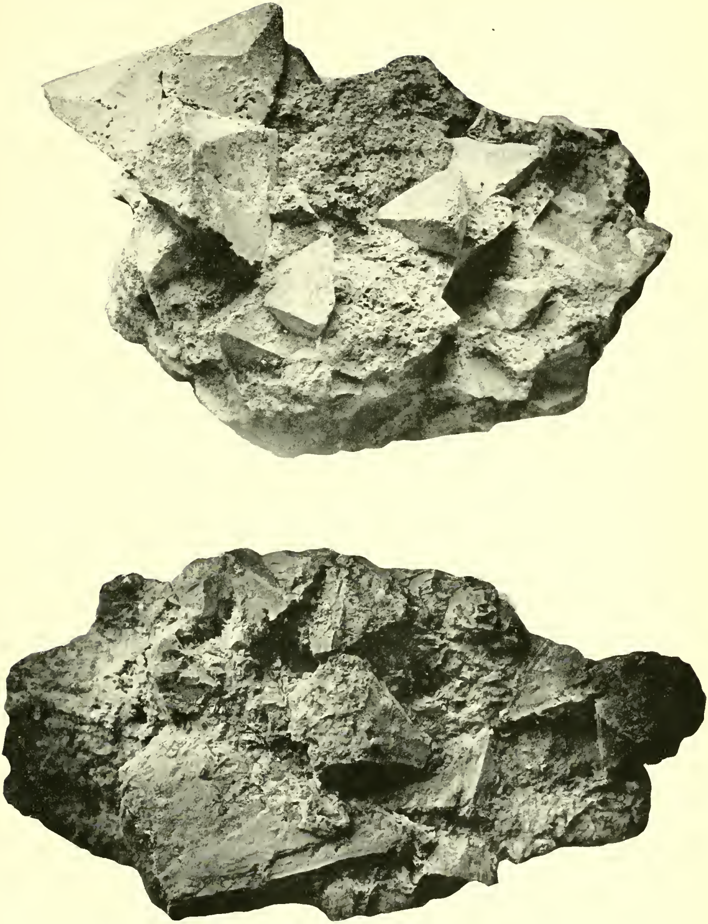
Crystals of Scheelite and Cinnabar.

For description of specimens see pages 303-304.



VESUVIANITE FROM EASTERN SIBERIA.

FOR DESCRIPTION OF SPECIMEN SEE PAGE 304



Achtaragdite from Eastern Siberia, and Crystals of Zincite.

Fof description of specimens see page 304.

A SMALL COLLECTION OF FISHES FROM SOOCHOW, CHINA, WITH DESCRIPTIONS OF TWO NEW SPECIES.

By Henry W. Fowler,
Of the Academy of Natural Sciences of Philadelphia,
and
Barton A. Bean,
Of the United States National Museum.

The present collection consists of a number of small fishes sent as a lot of samples, by Mr. N. Gist Gee, from Soochow, China, to the United States Bureau of Fisheries at Washington, District of Columbia. Through the interest of Dr. Hugh M. Smith they were placed in our hands for study, then to be installed in the United States National Museum. For the most part they represent species but little known, and two appear to be new.

Family ENGRAULIDIDAE.

COILIA CLUPEOIDES (Lacépède).

Head, 6; depth, $5\frac{2}{3}$; D. III, 9; A. 83; abdominal scutes, $17+28$; 60 (?) (pockets) scales in lateral row from shoulder to caudal base medially; 14 predorsal scales; 10 scales transversely from anal origin to middle of back behind dorsal; snout, $4\frac{1}{5}$ in head; eye, 5; interorbital, $2\frac{2}{5}$. Head width, half its length. Snout conic, cavernous, like interorbital and top of head, width half its length. Eye at first third in head. Mouth large, symphysis about midway in snout length. Maxillary extends $1+\frac{2}{3}$ eye diameters beyond opercle, expansion $1\frac{1}{4}$ in eye. Entire maxillary edge with row of fine teeth. Gill-rakers $17+30$, slender, lanceolate, equal eye, and filaments half length of rakers. Scales all fallen. First branched dorsal ray $1\frac{1}{8}$ in head; second anal ray $3\frac{1}{5}$; ventral, 2; pectoral, $2\frac{4}{5}$ to caudal base, rays long and filamentous. Body uniform pale brownish in alcohol. Dorsal and anal terminally dusted with pale dusky. Iris pale slaty. Length, 133 mm.

Family SALANGIDAE.

SALANX CUVIERI Cuvier and Valenciennes.

Head, $4\frac{7}{8}$ to 6; depth, 1 to $2\frac{1}{4}$ in head; D. III, 9 (?) or 10; A. II, 20 (?) or 23; P. I, 8; snout, $2\frac{2}{3}$ to 3 in head; eye, $2\frac{3}{4}$ to $6\frac{1}{4}$; maxillary, $2\frac{1}{4}$ to $2\frac{4}{5}$; interorbital, 2–3. Body moderately compressed, deepest midway

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in its length. Head strongly depressed, width $2\frac{1}{4}$ to $2\frac{7}{8}$ its length. Snout greatly depressed, width $1\frac{1}{6}$ its length; length half its width in young. Eyes largely ventral. Maxillary not quite to eye, only to first third in young, curved downward and ventrally. Few slender curved teeth in row along each side of upper jaw, similar smaller teeth below. Jaws equal in front. Interorbital level. Origin of dorsal midway between ventral origin and caudal base, little nearer caudal base than pectoral tip in young; anal inserted close behind dorsal origin, close behind dorsal base in young; caudal forked, $1\frac{1}{4}$ to $1\frac{3}{4}$ in head; adipose fin placed at first $\frac{2}{5}$ in space behind last anal ray base and caudal base; ventral inserted midway between snout tip and caudal base, fin $1\frac{2}{5}$ to $2\frac{3}{5}$ in head; in young ventral inserted midway between snout tip and last anal ray base; pectoral, $2\frac{1}{5}$ to $2\frac{1}{4}$. In alcohol color is brown on back, undersurface pale to whitish. Two examples, 48 to 118 mm.

Salanx hyalocranius J. F. Abbott[1] is apparently identical, the alleged characters given being merely variations of age.

Family MONOPTERIDAE.

FLUTA ALBA (Ziuew).

One example, 405 mm. long.

Family ANGUILLIDAE.

ANGUILLA JAPONICA Schlegel.

Head, $3\frac{2}{5}$ to vent; depth, 7; head and trunk, $1\frac{4}{7}$ in rest of body; snout, $5\frac{3}{4}$ in head; maxillary, $3\frac{2}{5}$; interorbital, 6; pectoral, $2\frac{4}{5}$; eye, 2 in snout; space between dorsal and anal origins $1\frac{1}{4}$ in head. In alcohol brown above, pale to whitish below. Pectorals whitish, also anal. Dorsals and caudal dusky, with very narrow pale edge. One example, 375 mm.

Family SILURIDAE.

PARASILURUS ASOTUS (Linnaeus).

Head, $4\frac{2}{3}$; depth, $6\frac{2}{5}$; D. I, 4; A., 80; snout, $3\frac{1}{4}$ in head from upper jaw tip; eye, $8\frac{4}{5}$; mouth width, $1\frac{2}{3}$; interorbital, $2\frac{1}{8}$. Head width, $1\frac{2}{5}$ its total length. Snout broadly depressed, length $\frac{2}{5}$ its width. Lower jaw slightly protrudes, symphysis level with middle of eye; maxillary to front pupil edge. Maxillary barbel reaches opposite dorsal origin. Mental barbel, $2\frac{1}{8}$ to hind edge of gill opening. Teeth conic, fine, in moderate bands in jaws and narrower band across vomer and palatines. Interorbital slightly convex. Gill rakers, 1 + 9; lanceolate, $1\frac{1}{4}$ in filaments or about long as eye. Dorsal length, 3 in total head length; second anal ray, $2\frac{1}{2}$; caudal slightly emarginate, with rounded lobes and joined with anal; upper lobe, $1\frac{2}{3}$; least depth of caudal peduncle, 4; pectoral, $1\frac{3}{4}$; and flattened spine, $\frac{3}{5}$ of fin, both edges serrate, front edge antrorsely serrate; pectoral reaches little beyond dorsal base, but not to ventral; ventral $2\frac{3}{4}$, close before anal; anal papilla well developed. In alcohol brownish-drab generally. Under surface of head, breast, belly, and lower surfaces and edges of paired fins, pinkish-buff. Length, 235 mm.

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[1] Proc. U. S. Nat. Mus., vol. 23, 1901, p. 490, fig. Tién-Tsin.

FLUVIDRACO FLUVIDRACO (Richardson).

Head, $3\frac{1}{4}$; depth, $3\frac{2}{3}$; D. I., 7; A. v., 15; snout, $3\frac{1}{8}$ in head; eye, $4\frac{1}{5}$; mouth width, $2\frac{1}{5}$; interorbital, $2\frac{2}{3}$. Head width, $1\frac{1}{5}$ in its length. Snout broad, depressed, length half its width. Lower jaw shorter than upper. Maxillary reaches $\frac{2}{3}$ in snout. Maxillary barbel longer than head by pupil length. Nasal barbel, $1\frac{3}{4}$ to hind edge of gill opening. Outer mental barbel, $1\frac{1}{3}$ in head; inner, 2. Teeth villiform, in moderate simple bands in jaws, narrower band parallel across vomer and palatines. Interorbital broadly and slightly convex. Gill rakers, 4 + 9 lanceolate, $1\frac{1}{4}$ in eye; filaments, $\frac{3}{4}$ of rakers. Dorsal buckler and occipital process form complete bony bridge. First dorsal ray $1\frac{1}{5}$ in head; spine, $1\frac{1}{5}$ in fin; first anal ray, 2 in head; dorsal spine, $1\frac{2}{3}$, both edges with obsolete serrae; caudal strongly forked, $1\frac{1}{6}$ in head; adipose fin, $1\frac{2}{3}$; pectoral, $1\frac{1}{5}$; spine finely antrorse serrate along outer edge, inner with 12 large serrae, $1\frac{2}{5}$ in head; ventral, 2; humeral process, 2; finely rugose.

In alcohol cinnamon-drab to fawn color; upper surface of head brownish; iris pale slaty; nasal and maxillary barbels pale brown above, pinkish-buff below, like mental barbels and lower surface of head; fin spines pale and most all, except brownish adipose fin, tinged with dusky; upper and lower caudal edges paler than median portion of fin; hind dorsal rays, also of pectoral, and both hind and front ventral and anal rays, whitish. Length, 105 mm.

Family COBITIDIDAE.

MISGURNUS ANGUILLICAUDATUS (Cantor).

Head, $3\frac{4}{5}$ to $6\frac{1}{4}$; depth, $6\frac{1}{4}$ to $6\frac{1}{2}$; D. II, 7; A. III, 5; scales, 142 in median lateral series from shoulder to caudal base; 30 scales transversely between dorsal and ventral origins; 85 predorsal scales; snout, 3 to $3\frac{1}{5}$; eye, $3\frac{3}{4}$ to $5\frac{3}{4}$; interorbital, 4 to $5\frac{1}{4}$. Head width, $1\frac{4}{5}$ its length. Snout width, 1 to $1\frac{1}{4}$ its length. Eye anterior, $1\frac{1}{2}$ to 2 in snout. Two hind maxillary barbels each side longer than median frontal pair, $3\frac{1}{3}$ in head. Hind mental barbels twice length of front mental pair or $4\frac{2}{3}$ in head. Interorbital convex. Gill opening restricted laterally, $2\frac{1}{2}$ in head. Scales cycloid, radiating striae, 45 to 50 with about 23 to 25 incomplete marginal accessories, and circuli moderately fine. Dorsal origin little nearer gill opening than caudal base, little nearer caudal base in young; first branched dorsal ray,

$1\frac{1}{6}$ to $1\frac{2}{3}$ in head; first anal ray, $1\frac{2}{5}$ to 2; caudal, 1 to $1+\frac{2}{9}$ in head; pectoral, $1\frac{1}{10}$ to $1\frac{4}{5}$; ventral, $1\frac{1}{2}$ to $2\frac{1}{5}$.

In alcohol sepia-brown above, finely and obscurely mottled with dusky. Lower surface of head, belly, and abdomen pale grayish-venaceous, and pale violet-gray to lavender tint on breast. Dorsal, caudal, and pectoral pale brownish, finely dotted little darker, and blackish ocellus at bases of upper caudal rays about size of eye. Pectoral, ventral, and anal grayish-venaceous. In young color more dilute brownish, mottled with dark specks. Two dusky blotches at caudal base. Dusky streak forward from eye to snout tip. Fins finely mottled with dusky. Two examples, 47 and 180 mm.

Family CYPRINIDAE.

Subfamily Cyprininae.

CARASSIUS AURATUS (Linnaeus).

Two specimens, 110 and 125 mm.

Subfamily Rhodeinae.

ACANTHORHODEUS ASMUSSI (Dybowski).

Head, $3\frac{3}{4}$; depth, $2\frac{1}{5}$; D. II, 16; A. II, 13; scales (damaged) in lateral line about 32 to caudal base and 2 more on latter; 6 scales above lateral line to dorsal and 5 below to anal; 14 predorsal scales; snout, $3\frac{1}{2}$ in head; eye, $3\frac{1}{6}$; maxillary, $3\frac{1}{5}$; interorbital, 3. Head width, $1\frac{7}{8}$ its length. Snout conic length, $\frac{2}{3}$ its width. Maxillary reaches eye, with very slight or rudimentary terminal barbel. Interorbital slightly convex. Gill opening to hind eye edge. Teeth 5–5, compressed, without terminal hook and inner edge of each strongly crenulate. Rakers 2+7 short rudimentary points, greatly shorter than filaments, which $1\frac{1}{2}$ in eye. Scales with 34 or 35 irregular waved basal radiating striae; circuli moderate. First branched dorsal ray equals head length; first branched anal ray, $1\frac{1}{4}$; lower caudal lobe, $1+\frac{1}{5}$; pectoral, $1\frac{2}{5}$; ventral, $1\frac{1}{3}$. In alcohol mikado brown generally; fins all pale brownish, slightly grayish terminally; parallel with vertebral column, opposite anal, dark or dusky streak, and continued in caudal peduncle to caudal base; iris white. Length, 87 mm.

Subfamily Gobioninae.

PSEUDOGOBIO SINENSIS (Kner).

Head, $3\frac{3}{4}$; depth, $4\frac{4}{5}$; D. III, 7, I; A. II, 5; scales, 32 in lateral line to caudal base and 2 more on latter; 6 scales above lateral line to dorsal, 4 below to anal; 12 predorsal scales; snout, $2\frac{1}{5}$ in head; eye, $3\frac{7}{8}$; maxillary, $3\frac{4}{5}$; interorbital, $3\frac{4}{5}$. Head width, $1\frac{5}{6}$ its length. Snout conic, long as wide, with slight depression medially in profile. Maxillary, $\frac{2}{5}$ of snout, with thick terminal barbel, $1\frac{1}{2}$ in eye. As seen below lips horseshoe-shaped, lower with slight median lobe each side. Interorbital slightly depressed, scarcely concave. Gill opening forward to hind postorbital edge. Rakers, $1+10$, short points, much less than filaments, which are $1\frac{1}{6}$ in eye. Teeth, 5–5, with broad smooth grinding surfaces, ends moderately curved or hooked. Scales with 26 to 35 terminal radiating striae; circuli coarse and rather few. Dorsal inserted little nearer snout tip than last anal ray base, first branched ray, $1\frac{1}{10}$ in head; first branched anal ray, $1\frac{2}{5}$; upper caudal lobe, $1+\frac{1}{10}$, well emarginate behind and lobes pointed; pectoral, $1+\frac{1}{10}$, nearly to ventral; ventral, $1\frac{2}{5}$, or $1\frac{1}{4}$ to anal, inserted little behind dorsal origin.

In alcohol nearly walnut-brown; scarcely paler below. Seven indistinct dull obscure rounded blotches, each about size of eye along lateral line and made up of dusky dots. Scales on back medially and along lateral line each with fine dusky dots terminally submarginal. Pale dusky streak from eye forward toward snout tip, another postorbital forward along suborbitals toward maxillary. Iris, pale slaty. Fins, all pale. Dorsal with six horizontal pale dusky lines, and caudal crossed by as many transversely, also small black spot at base of fin medially. Pectoral with six pale transverse streaks and four across ventral. Length, 90 mm.

Pseudogobio drakei J. F. Abbott differs in having 46 scales in the lateral line and unspotted fins.

Subfamily LEUCISCINAE.

EXOGLOSSOPS, new genus.

Body robust and caudal peduncle deep. Head moderate. Eye small. Mouth inferior, with hard or bony lower jaw. No barbels. Pharyngeal teeth uniserial. Scales moderate, with well developed basal radiating striae, mostly uniform in size. Lateral line complete. Dorsal opposite ventral. Dorsal and anal without strong bony rays in front.

Characterized by the uniserial pharyngeal teeth, horny mandible, absence of barbels, large scales, etc. In a superficial way it suggests the American *Exoglossum*.

Type.—Exoglossops geei, new species.

(Ἔξω, outside; *γλῶσσα*, tongue; *ὧψ*, appearance.)

EXOGLOSSOPS GEEI, new species.

Head, 4; depth, $3\frac{1}{6}$; D. III. 7, I.; A. III. 6; P. I. 16; V. I. 7; scales, 38 in lateral line to caudal base, and 4 more on latter; 6 scales above lateral line to dorsal origin; 6 scales below lateral line to anal origin; 14 predorsal scales; head width, $1\frac{2}{3}$ in its length; snout, 3; eye, $4\frac{1}{3}$; maxillary, 3; interorbital, $2\frac{2}{5}$; first branched dorsal ray, 1; first branched anal ray, $1\frac{1}{3}$; least depth of caudal peduncle, $1\frac{3}{5}$; pectoral $1\frac{1}{6}$; ventral, $1\frac{1}{3}$.

Body oblong, compressed, robust, deepest about last third in depressed pectoral, and edges all convexly rounded. Caudal peduncle deep, compressed, least depth about four-fifths its length.

Head blunt, moderately compressed, flattened sides but slightly approximate below, and lower profile much more inclined. Snout broadly convex; length four-fifths its width. Eye elevated, diameter less than snout. Mouth oblique, slightly inferior. Maxillary well inclined to nostrils. Lips rather narrow, tough, with small lobe each side behind. Lower lip horny plate, and as seen below with broad median entire edge. Nostrils together, little nearer eye than snout tip. Interorbital slightly convex, depressed medially. Preorbital long as eye and suborbitals form narrow chain.

Gill opening forward to hind preopercle edge. Rakers, 2+8?, short weak rudiments, much less than filaments, which equal eye.

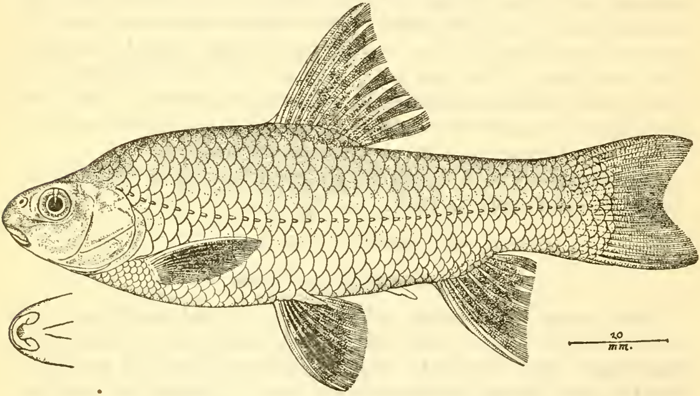

FIG. 1.—EXOGLOSSOPS GEEI, NEW SPECIES.

Teeth, 5—5, hooked, with broad, smooth grinding surfaces. Scales large, cycloid, more or less uniform, in even longitudinal rows. Scales on breast smaller than elsewhere. Scales with 36 apical radiating striae, and circuli fine. Ventral axillary scale well developed. Lateral line complete, of simple tubes midway along side.

Dorsal origin little nearer snout tip than caudal base; first branched ray depressed little longer than last. Anal inserted close behind depressed dorsal, similar to same. Pectoral not quite reaching ventral, which is inserted opposite dorsal origin, and reaches anal papilla. Latter long as eye.

Color in alcohol cameo to cinnamon brown generally, head and lower surfaces scarcely paler. Dorsal pale brownish, with dark oblique sub-basal streak, outer portion on fin soiled brownish. Anal largely dark brown, edges pale or whitish. Paired fins all darker to deep brown or dusky, edges all pale, whitish near ends. Caudal pale brown, also iris.

Length, 145 mm.

Type.—Cat. No. 83981. U.S.N.M.

Soochow, China. Mr. N. Gist Gee.

Only the type known.

(Named for Mr. N. Gist Gee.)

MYLOLEUCISCUS ATRIPINNIS Garman.

Head, 3½; depth, 3⅞; D. III, 7; A. III, 8; scales (damaged) in lateral line, 39 to caudal base and 2 more on latter; 6 scales above lateral line to dorsal, 4 below to anal; 14 predorsal scales; snout 4 in head; eye, 3⅕; maxillary, 3½; interorbital, 2⅓; head width, 1⅞. Snout depressed, rather obtuse, length two-thirds its width. Maxillary not quite to eye. No barbels. Interorbital depressed, but slightly convex. Gill opening forward about opposite postorbital edge. Rakers rudimentary, 2 + 7 obscure fleshy points, greatly shorter than filaments, which are 1⅕ in eye. Teeth 4–5, strong, short, conic; 2 or 3 molar-like; others shorter, with broad grinding surfaces. Scales with 2 to 9 apical radiating striae and basal circuli 22 to 30. First branched dorsal ray 1¼ in head; first branched anal ray 1⅔; caudal, $1+\frac{2}{7}$; pectoral, 1⅖; ventral, 1½.

In alcohol pale worm brown generally, each scale with dusky dots along edges. Fins all brownish, thickly sprinkled with blackish dots, dusted in appearance, and less pronounced on caudal basally, which rather brownish. Iris pale leaden. No caudal spot or leaden band. Length, 82 mm.

As contended by Garman, *Leuciscus aethiops* Basilewsky is evidently congeneric, and may even be identical.

CULTER BREVICAUDA Günther.

Head, 3⅞; depth, 4¼; D. II, 7; A. III, 28; scales 63 in lateral line to caudal base, and 3 more on latter; 12 scales above lateral line to dorsal origin, 7 below to anal origin; 40 predorsal scales; snout, 3⅗ in head measured from upper jaw tip; eye, 4⅕; maxillary, 3; interorbital, 5. Head width, 2¾ in its total length. Snout conic, long as wide. Maxillary three-fourths of snout. No barbels. Interorbital slightly convex. Suborbital width narrow, covers about half of cheek. Gill opening forward to eye center. Rakers 7 + 20, lanceolate, long as filaments or 1⅘ in eye. Teeth 2, 3, 4—4, 3, 2, with slight terminal hooks and moderate grinding surfaces. Scales with 8 to 15 apical radiating striae, and circuli rather coarse, especially apically. Dorsal inserted about midway between hind eye edge and caudal base, first branched ray 1¼ in head; first branched anal ray 2; upper caudal lobe 1¼, fin well forked; pectoral 1⅕, reaches ventral, which inserted well before dorsal or reaches 1¼ to anal or 1⅖ in head. In alcohol generally ochraceous—buff, slightly darker on back; pale brownish line from gill opening along side of back to caudal base medially, little wider behind; fins and head all pale or whitish; iris slaty. Length, 147 mm.

Family HEMIRAMPHIDAE.

HYPORHAMPHUS SINENSIS (Günther).

Head from snout tip, 4¾; depth, 2⅗ in head measured from snout tip; D. II, 14; A. II, 16; head from snout tip, 1¼ in rest of beak; snout, 2½ in head from upper jaw tip; eye, 4½; maxillary, 3; interorbital, 4½. Body but slightly compressed. Head width, 3¾ in head measured from upper jaw tip. Snout depressed, elongately triangular as seen from above; width at eyes 1⅔ its length. Eye large, 1⅘ in postocular region. Narrow bands of fine teeth in jaws. Maxillary ¾ to eye. Interorbital level. Gill opening forward to front pupil edge. Rakers, 8 + 20, lanceolate, longest ¾ of filaments and latter 1⅖ in eye. Scales very deciduous, mostly fallen, with 3 or 4 basal radiating striae; coarse circuli about 14. Dorsal inserted little behind last third in space between pectoral origin and caudal base; first branched dorsal ray 3 in head measured from snout tip; anal inserted opposite dorsal, first branched ray 2⅚; caudal slightly emarginate behind, 1½ in head; pectoral, 1½; ventral inserted midway between uppermost edge of gill opening and caudal base, fin, 2½.

In alcohol pale clay color generally. Sides of head, especially opercle, iris and broad longitudinal band nearly equal to eye in width, from shoulder to caudal base medially, bright silvery white. Beak pale brown and uniform fins all much lighter. Length, 155 mm.

This example differs a little from *Hemirhamphus sinensis* Gunther in that the body appears but little compressed, lower jaw beyond snout tip 4¾ to caudal base, triangular part of upper jaw wide at lung, eye slightly less than interorbital, or ½ of postorbital, and ventral origin placed little more posterior.

Family SERRANIDAE.

SINIPERCA CHUATSI (Basilewsky).[1]

Head, 2⅖; depth, 2⅞; D. XII, 14, τ; A. III, 9, τ; pores in lateral line about 110 to caudal base; scales about 120 rows along lateral line to caudal base; 26 scales above lateral line to soft dorsal origin, 54 below to spinous anal origin; 34 predorsal scales; snout 4 in head measured from upper jaw tip; eye, 5¾; maxillary, 2⅕; interorbital, 8. Back well elevated. Head width 2¾ in its total length, and upper profile slightly concave over eye. Snout width slightly less than its length. Mandible well protruded. Maxillary extends slightly beyond eye, expansion 1⅓ in eye. Teeth in rather narrow bands in jaws, front upper ones and few along each side below little enlarged; patch of small teeth on vomer and palatines. Preopercle edge denticulate; 2 large spines diverge at angle and 2 more down and forward on lower edge. Rakers 1+6, lanceolate $1\frac{1}{3}$ in eye, and filaments $\frac{5}{6}$ of rakers. About 40 rows of cheek scales; scales with 7 to 9 basal radiating striae, and apical striae 14 to 20. Fifth dorsal spine $2\frac{1}{3}$ in total head length; eighth dorsal ray 3; second anal spine $2\frac{9}{10}$; second anal ray $2\frac{1}{10}$; caudal 2; pectoral $2\frac{1}{3}$; ventral $2\frac{1}{10}$; spine $\frac{3}{5}$ of fin.

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[1] Cat. Fish. Brit. Mus., vol. 6, 1866, p. 265

In alcohol ochraceous-tawny, with 4 slightly darker cross-bars; lower surface pale to buff, also most of fins, terminal part of spinous dorsal membrane blackish; soft dorsal and caudal with several pale tawny blotches; maxillary and mandible pale-like lower surface of head, though sides of mandible with 3 obscure tawny blotches; iris brownish-slate. Length 150 mm.

Family SCIAENIDAE.

COLLICHTHYS LUCIDUS (Richardson).

Head 3; depth 3; D. IX, 28; A. II, 13; scales very caducous, thin, few remaining, about 50? (mostly pockets counted) in lateral line to caudal base; snout $3\frac{1}{6}$ in head measured from upper jaw tip; eye 5; maxillary $1\frac{1}{2}$; interorbital $2\frac{2}{5}$; head width $1\frac{9}{10}$. Least depth of caudal peduncle half its length, which is 2 in head. Snout broad, convex, length $\frac{3}{4}$ its width. Maxillary extends well beyond eye, expansion equals latter. Lower jaw slightly protrudes. Narrow band of fine teeth in each jaw, no canines. Head very cavernous. Median occipital ridge with 5 denticles, first of which points forward. Rakers 12+20, lanceolate, equal $1+\frac{3}{4}$ eye diameters, and filaments $\frac{1}{3}$ of rakers. Scales with 7 basal radiating striae, and coarse circuli 7 to 20. Lateral line complete, tubes rather large and simple, midway along side of caudal peduncle. Second dorsal spine 3 in head; twenty-fifth dorsal ray 2; seventh anal ray $1\frac{2}{3}$; caudal ends in long median point; $2\frac{1}{8}$ in combined head and trunk; pectoral $1\frac{2}{5}$ in head; ventral $1\frac{2}{3}$.

In alcohol back nearly benzo-brown, deeper along dorsal bases; under surface pale to whitish; whole body with more or less silvery sheen; iris silvery-white; head paler than trunk; fins all pale or gray-white, dorsals little darker terminally, and caudal with dusky point. Length 84 mm.

Family OPHICEPHALIDAE.

OPHICEPHALUS PEKINENSIS Basilewsky.

Head, $2\frac{9}{10}$; depth, 6; D. 49; A. 31; scales, 61 in lateral line to caudal base; 6 scales above lateral line to dorsal origin, 12 below to anal origin; 30 predorsal scales; snout, $5\frac{1}{3}$ in head from upper jaw tip; eye, 7; maxillary, $2\frac{1}{2}$; interorbital, $5\frac{3}{4}$. Head width, $2\frac{1}{10}$ in total head length. Snout convex, width $\frac{3}{4}$ its length. Maxillary extends little beyond eye, expansion $1\frac{2}{3}$ in same. Lower jaw projects. Narrow bands of small teeth in jaws, some enlarged short conic teeth along sides of mandible and on palatines. Interorbital level. Rakers III+VI short low tubercles, rather irregular, largest little less than filaments, which $1\frac{1}{3}$ in eye. Scales with 10 to 18 basal radiating striae, and circuli moderate; 13 scales on cheek behind eye to preopercle edge; scales but very little larger on top of head medially than on occiput and cheeks. Least depth of caudal peduncle, $3\frac{4}{5}$ in total head length; caudal, $1\frac{3}{4}$; pectoral, $2\frac{2}{5}$; ventral, $3\frac{1}{8}$.

In alcohol deep neutral gray generally on back and upper surfaces, sides tinged with snuff-brown; under surface of head and body white, marked with small irregular spots of sepia; dozen pairs of large blotches, mostly vertical in disposition, irregular, along each side of trunk and three more on top of head; below some of dark blotches may fork or extend down into white of under surface, in which region is rich sepia; 2 dark longitudinal bands extend back from eye to gill-opening, well separated and slightly divergent to gill opening; dorsal and caudal deep neutral tint and anal pale basally, neutral to dusky marginally; pectoral pale brownish, round blackish spot size of pupil at base medially; ventral pale buff. Length 168 mm.

Family ANABANTIDAE.

POLYACANTHUS OPERCULARIS (Linnaeus).

Head, $3\frac{1}{4}$; depth, $2\frac{4}{5}$; D. XII, 6; A. XXI, 10; P. τ, 9; v. I, 5; scales 28 in median lateral series from shoulder to caudal base medially; 14 scales transversely between spinous dorsal and anal origins; 8 scales transversely across caudal peduncle; 21 predorsal scales; head width $1\frac{9}{10}$ its length; twelfth dorsal spine 2; least depth of caudal peduncle, 2; pectoral, $1\frac{1}{2}$; ventral, $1\frac{1}{8}$; snout, $4\frac{1}{4}$; in head, measured from upper jaw tip; eye, 4; maxillary, $3\frac{1}{2}$; interorbital, $3\frac{1}{4}$.

Body strongly compressed, rather evenly ellipsoid, deepest about midway in length. Flattened sides of head evenly converge above and below. Snout conic, length $3\frac{1}{5}$ its width. Eye little advanced. Mouth oblique, mandible protruding. Maxillary not quite to eye, about $\frac{4}{5}$ in snout, expansion $1\frac{4}{5}$ in eye. Teeth fine, in bands in jaws. Interorbital moderately convex. Hind preopercle edge mostly entire, few weak serrae at lower hind angle. Gill opening to hind eye edge. Rakers rudimentary. Filaments about two-fifths of eye. Head, except lips, preorbital and mandible closely scaled; 4 rows of scales on cheek to preopercle angle; smaller scales crowded on bases of unpaired fins, especially caudal; scales with 12 basal radiating striae, and apical denticles 50; circuli moderate; branchiostegal membrane point extending backward nearly far as caudal; spinous anal, about covered with small scales. Median dorsal rays produced as long opposite that of dorsal and rayed fin like soft dorsal; caudal rounded behind, much longer than head; pectoral rounded, inserted before dorsal; ventral inserted slightly behind pectoral origin; spine, one-third of fin and latter with first ray divided.

In alcohol bars of back brown to cinnamon-brown, becoming buff on lower sides and undersurfaces of head and trunk. Muzzle pale. Iris dull slaty. Upper surface of head mottled with cinnamon-brown; postocular oblique cinnamon-brown band down until opposite pectoral base and another crosses cheek from lower aye edge to chest; black opercular blotch about size of eye. Spinous dorsal and anal dusky or dusky neutral gray, becoming more neutral gray to brownish on rayed fins, though both of latter with obscure fine dark specks. Caudal and pectoral pale buff-pink, formed with many small, close-set darker spots. Length, 65 mm.

Family TETRODONTIDAE.

SPHEROIDES OCELLATUS (Osbeck).

Head, $2\frac{3}{4}$ to 3; depth (contracted), $3\frac{1}{8}$ to $3\frac{3}{5}$; D. IV, 12 or 13; A. III, 9 or 10; snout, $2\frac{1}{3}$ to $2\frac{2}{3}$ in head; eye, $5\frac{1}{3}$ to $6\frac{1}{5}$; mouth width, 3 to $3\frac{3}{4}$; interorbital bony width, $2\frac{3}{4}$ to $2\frac{7}{8}$; head width, $1\frac{1}{5}$ to $1\frac{1}{4}$. Snout depressed, length three-fourths to four-fifths its width. Eye slightly advanced. Mouth rather small. Lips papillose. Nostrils fleshy prominence, each with 2 pores. Interorbital broadly convex. Gill opening $3\frac{3}{4}$ to $5\frac{1}{10}$ in head. Back or predorsal nearly to nostrils finely asperous; sides smooth only in one small example, in others slightly rough area extends down over postocular region and another over postpectoral area to join asperous inflatable abdomen. Dorsal, $1\frac{2}{5}$ to $1\frac{2}{3}$ in head; anal, $1\frac{1}{2}$ to $1\frac{2}{3}$; caudal, $1\frac{1}{2}$ to $1\frac{3}{4}$; pectoral, 2 to $2\frac{3}{5}$.

In alcohol back drab brown, marked by irregular pale round spots; black blotch little larger than eye behind and slightly above pectoral axil and bordered in front and behind by pale line, each extending entirely across back to meet its fellow; dorsal base on large black blotch its entire extent, bordered broadly with paler; small round black spot, size of pupil, at pectoral base little above middle; fins all pale like belly, dorsal and caudal slightly darker; in 2 examples pale spots largely faded though transverse pale lines on back distinct; besides another across postocular; small black suprapectoral and dorsal blotches prominent. Two examples, 83 to 110 mm.

Family SCORPAENIDAE.

MINOUS MONODACTYLUS (Schneider).

Head, $2\frac{1}{2}$; depth, $3\frac{1}{5}$; D. X, 11; A. 9; snout, $2\frac{2}{3}$ in head measured from upper jaw tip; eye, $4\frac{1}{8}$; maxillary, $2\frac{1}{8}$. interorbital, $3\frac{1}{4}$. Head width $1\frac{2}{5}$ in total head length. Snout depressed medially, long as wide. Eye supero-lateral, slightly advanced from center. Mouth moderate, lower jaw well protruded. Maxillary to eye center, expansion $1\frac{1}{2}$ in eye. Teeth fine, in narrow bands in jaws; vomer with small cluster of fine teeth each side. Interorbital concave, likewise cheek and cranium, coarsely rugose. Preorbital with 2 spines, long hind one strong and directed back. Median strong preopercle spine horizontal, with small point at base, another small point above and four broad ones below; cheek buckles with small spine opposite middle of eye; each parietal ridge with two broad spines, hind one larger; postocular ridge ends in strong spine at suprascapula; preocular ridge with eight low even marginal denticles. Rakers $4+9$, lanceolate, equal filaments or $2\frac{1}{5}$ in eye. First dorsal spine 3 in head; least depth of caudal peduncle $3\frac{3}{5}$; caudal $1\frac{2}{5}$; pectoral $1\frac{1}{4}$, filament 2; ventral $1\frac{1}{2}$. Back brownish-drab in alcohol; lower surface white; bony ridges of head pale brown; terminal edges of dorsals and anal, most of pectoral and ventral black; bases of paired fins and anal whitish; caudal avellaneous, with three broad dark crossbars. Length 90mm.

Minous adamsi Richardson and *M. echigonius* Jordan and Starks, the latter only from Japan, are very closely related and possibly are really not distinct.

Family COTTIDAE.

TRACHIDERMIS FASCIATUS (Heckel).

Head, $2\frac{4}{5}$; depth, $4\frac{1}{2}$; D. VIII, 19; A. 17; P. 10, 7; snout, $3\frac{1}{5}$ in head; eye, 9; maxillary, $2\frac{1}{5}$; interorbital, $3\frac{4}{5}$; head width, $1\frac{2}{5}$. Snout depressed, broad, length $\frac{3}{4}$ its width at front of eyes. Mouth broad, lower jaw slightly included. Maxillary to hind pupil edge, expansion equals eye. Teeth fine, in bands in jaws, on vomer and palatines. Interorbital slightly concave. Lower preopercle edge with 4 broad short spines, terminal or angular hooked upward. Rakers 9 very short rudiments on lower arch. Skin on head finely wrinkled and papillose; in trunk finely asperous, though prickles not extending on under surface. Lateral line with 38 small pores. Third dorsal spine 4 in head; seventh dorsal ray $2\frac{2}{3}$; seventh anal ray 3; caudal 2; pectoral $1\frac{3}{5}$; ventral $2\frac{2}{3}$; least depth of caudal peduncle $5\frac{7}{8}$. In alcohol general color light buff, back and upper surfaces with obscure and very pale traces of brownish mottling; similar traces of pale brownish dots on pectoral and caudal fins basally.

Family GOBIIDAE.

Subfamily ELEOTRINAE.

MICROPERCOPS, new genus.

Allied with *Eviota* Jenkins and *Trimma* Jordan and Seale, in its naked sides of the head and unarmed preopercle. It agrees with *Trimma* with the fully scaled nuchal region, in which respect it differs from *Eviota*. From both, however, it differs in the presence of the increased dorsal spines and much smaller scales.

Philypnus cinctus Dabry de Theirsant,[1] is described with but 7 dorsal spines and 36 scales in the lateral line. It evidently belongs in the present genus.

Type.—Micropercops dabryi, new species.

(*Microperca*, the smallest of American Darters, to which this little goby bears a superficial resemblance.)

MICROPERCOPS DABRYI, new species.

Head, $3\frac{1}{8}$; depth, $4\frac{2}{5}$; D. IX–I, 11; A. I, 7; P. I, 11; V. I, 4; scales, 39 from shoulder to caudal base and 2 more on latter; 10 scales transversely between soft dorsal and anal; 18 predorsal scales; snout, $3\frac{2}{5}$ in head measured from upper jaw tip; eye, $3\frac{3}{4}$; maxillary, $2\frac{2}{5}$; interorbital, $3\frac{1}{2}$; head width, $1\frac{4}{5}$ in total head length; second dorsal spine, 3; first branched dorsal ray 2; first branched anal ray, $2\frac{1}{3}$; caudal $1\frac{1}{4}$; pectoral, $1\frac{1}{3}$; ventral, $1\frac{2}{3}$.

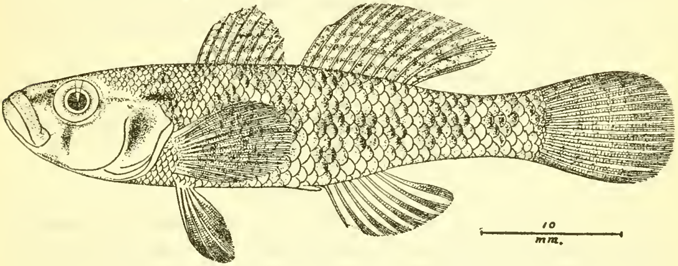

FIG. 2.—MICROPERCOPS DABRYI, NEW SPECIES.

Body elongate, slender, deepest at spinous dorsal, edges convexly rounded. Caudal peduncle compressed, least depth slightly over half its length.

Head well compressed, flattened sides slightly approximate above, and lower profile much more inclined. Snout conic, length $\frac{4}{5}$ its width. Eye large, little smaller than snout, little advanced. Mouth oblique and lower jaw well protruded. Maxillary not quite to eye, and expansion about wide at pupil. Teeth small, conic, simple, in bands in jaws. Nostrils separated, front one near upper front preorbital edge and hind one close to upper eye edge. Interorbital depressed, scarcely concave. Gill opening forward to eye center. Rakers 3+8, lanceolate, shorter than filaments, which equal eye. Scales crowded on predorsal and breast and largest on posterior regions. Head apparently naked, except small scales on occiput, which extend forward opposite hind pupil edge. Scales with 10 to 14 basal radiating striæ, 20 to 23 apical denticles and circuli coarse. No lateral line.

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[1] Am. Sci. Nat., ser. 6, vol. 1, Zool., 1874, p. 3, Mountains of Kiang-si.

Spinous dorsal inserted behind origins of paired fins, spines flexible and slender. Soft dorsal inserted about midway between front edge of eye and caudal base, and depressed fin $1\frac{1}{4}$ to latter. Anal inserted little behind soft dorsal origin, much smaller than soft dorsal. Caudal rather broad, rounded behind. Pectoral not quite to anal. Ventral inserted slightly behind pectoral origin, about $1\frac{1}{2}$ to anal. Anal papilla long as pupil.

Color in alcohol pale brownish, back and sides with nine darker crossbands, represented by as many of obscure brownish blotches along side medially, in which scale edges darker. Blackish blotch at suprascapula. Spinous dorsal dusky, otherwise fins all pale or dull gray-brown. Dorsals with five longitudinal dull dusky lines, and caudal with six obscure or slightly darker transverse lines. Iris pale slaty. Dark streaks from below eye over cheek and dusky blotch on opercle. Length, 47 mm.

Type.—Cat. No. 83982, U.S.N.M. Soochow, China. Mr. N. Gist Gee. Only the type obtained.

(For Pierre Dabry de Thiersant, an accomplished French fish-culturist and student of Chinese ichthyology.)

BUTIS BUTIS (Hamilton).

Head, $2\frac{2}{5}$; depth, $4\frac{7}{8}$; D. VII–I, 9; A. I. 8; scales, 36 in median lateral series from shoulders to caudal base; 13 scales transversely between anal and soft dorsal origins; predorsal scales 30; snout, 4 in head measured from upper jaw tip; eye, 5; maxillary, $2\frac{3}{5}$; interorbital, 5. Head width half of total head length. Snout depressed, width $\frac{4}{5}$ its length. Slight narrow supraorbital ridge. Maxillary reaches eye center, expansion half of eye. Mandible strongly projects. Teeth moderately long, conic, sharp pointed, in bands in jaw. Interorbital concave. Preopercle edge entire. Rakers 3 + 8 low broad tubercles, greatly shorter than filaments, which are $1\frac{3}{5}$ in eye. Scales with 10 to 12 basal radiating striae, apical denticles 29 to 35, and circuli moderate. Third dorsal spine, $2\frac{9}{10}$ in head; second anal ray, $2\frac{3}{5}$; caudal, $1\frac{1}{3}$; pectoral, $1\frac{3}{5}$; ventral, 2.

In alcohol walnut-brown on back; sides and under surface fawn color; three large dark round blotches on side, buckled across back by narrow dark bar; dorsals and caudal dark or dusky-gray; caudal marked with fine waved dark cross-bands; spinous dorsal largely deep dusky and about three longitudinal dark bands on soft dorsal; other fins pale like lower surface, with few blotches of deep brown, also pectoral base deep brown; undersurface of head speckled with darker. Length, 83 mm.

Family MASTACEMBELIDAE.

MASTACEMBELUS SINENSIS (Bleeker).

Head, $6\frac{1}{5}$; depth, $10\frac{2}{3}$; D. XXXIII, 65; A. III, 64; scales about 345 in median lateral count from shoulder to caudal base; 50 scales transversely between anal origin and spinous dorsal base; 35 predorsal scales to occiput; snout, $3\frac{1}{2}$ in head; eye, 8; maxillary, $2\frac{7}{8}$; interorbital, $7\frac{1}{4}$; pectoral, $3\frac{2}{5}$. Trunk, without head, equally long as rest of body. Head width $3\frac{7}{8}$ in its length. Snout conic, width $1\frac{4}{5}$ its length. Eye $2\frac{3}{5}$ in snout. Maxillary to pupil. Lower jaw slightly shorter than upper. Bands of moderate conic teeth in jaws, none on mouth roof. Interorbital convex. Strong spine below eye. Rakers rudimentary and filaments long as eye. Scales with 15 to 18 marginal radiating striae, also 2 or 3 basal lobes formed; circuli coarse. In alcohol generally fawn-color, reticulated with deep brown to dusky; lower surface all finely and evenly reticulated with grayish. Length, 206 mm.

Family SOLEIDAE.

CYNOGLOSSUS ABBREVIATUS Gray.

Head, 4; depth, $3\frac{4}{5}$; D. 105; A. 92; scales, 130 in median lateral line to caudal base; 24 scales above median lateral line to upper lateral line; snout, 3 in head; upper eye, 8; maxillary, $3\frac{1}{6}$; head depth $1\frac{1}{10}$; caudal $2\frac{4}{5}$. Maxillary extends eye diameter beyond lower eye. Eyes, about $\frac{2}{3}$ an eye-diameter apart, and upper half an eye diameter in advance of lower. Scales with 2 to 6 basal radiating striae and 2 to 5 long slender apical spines. In alcohol left side cinnamon drab, very indistinctly mottled with darker; right side paler, uniform; fins all pale. Iris slightly slaty. Length 78 mm.

It appears to agree with the account by Peters.[1]

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[1] Monatsber. Akad. Wiss. Berlin, 1880, p. 923.

RECENT ACCESSIONS IN THE DIVISION OF APPLIED GEOLOGY.

By Earl V. Shannon,
Assistant Curator of Geology, United States National Museum.

Owing to curtailment of imports and the urgent demand for certain unusual mineral products for use in war industries, the recent World War acted as a great stimulant to the mining industry, particularly in connection with what are popularly known as the minor minerals and rare earths. In endeavoring to do its part in the work of aiding production of these highly necessary raw materials, especial effort was made by this department to build up its series, both exhibition and study, of these ores and minerals with which the public was naturally little acquainted. That this effort was successful is shown by the large number of mining men who have visited the museum, both during and since the war, to acquaint themselves with the physical characteristics and associations of many of these uncommon ores. Some of the more important and striking of the materials acquired in this work are described in the following brief summary of the recent growth of the collections of applied geology.

The most notable recent accessions and those of greatest general interest are the ores of the rarer metals, most particularly the so-called minor metals used in steel manufacturing, which include tungsten, molybdenum, vanadium, and, to a less extent, chromium and titanium. These are of the utmost importance in the manufacture of alloy and tool steels which are used in the metal-working industries and are essential in the manufacture of munitions. The growth of the exhibition series of ores of these metals is in large measure due to the personal efforts of Mr. Frank L. Hess, honorary custodian of the collection of rare earths and rare metals. Through his extensive acquaintance with producers both in this country and abroad, Mr. Hess has been able to secure large numbers of exceptionally fine examples, especially of tungsten and molybdenum ores. These are too numerous to be described individually, and only a few of the larger and more striking will be mentioned.

Scheelite, or calcium tungstate, is one of the more important ores of tungsten, and contains, when pure, 80.6 per cent of tungsten trioxide. A specimen recently placed upon exhibition is presumably the largest single mass of this mineral ever mined. This specimen, which is 4 feet 8 inches in length and weighs in excess of 2,600 pounds, is estimated to contain 30 per cent of tungsten trioxide and had a market value, when mined, of more than $1,650. The specimen which shows the full width of the vein, is from the Union Mine, Atolia, California, and is a gift from the Atolia Mining Co. This district is the largest producer of scheelite ore in the world. When tungsten ore was in greatest demand during the war, operating companies sustained considerable losses through miners stealing small pieces of ore which they sold to illegitimate buyers, it being possible to carry several dollars worth of the high grade ore from the mine in an ordinary dinner pail. A number of excellent smaller specimens of scheelite have also been received from various western mines, especially from various localities in Nevada.

Wolframite, the most important of the ores of tungsten, is a double tungstate of iron and manganese intermediate between ferberite and hubnerite. Many fine specimens of wolframite have recently been received, many being from little known foreign mines. A specimen showing bladed and columnar black wolframite in quartz (Cat. 90, 564) from Eastern Kwangtung Province, China, is a gift from Sir Paul Chater, of Hongkong. A large specimen from Bukuka, 100 versts north of Borza station on the trans-Baikalian Railway, Siberia (Cat. 90657), was received from Mr. C. W. Purington. A large specimen showing wolframite in quartz (Cat. 88989) is from the Kam-Mine, Cochabamba, Bolivia; and Mr. B. Bryan has donated an exceptionally good specimen of wolframite (Cat. 90521) from Easley and Inslee's mine, east of La Paz, Bolivia. Mr. Rafael Taborga, of New York City, has donated a series of 30 specimens (Cat. 90435) from the San Antonio mine, Ponga, Oruro, Bolivia, showing black wolframite in quartz largely altered to beautiful canary yellow tungstite, the native trioxide of tungsten. Another very fine large specimen of wolframite (Cat. 90575) received through Mr. J. Morgan Clements is from the Yamomoto Mine, Ryudo, Chushihoku Province, Korea. Among American wolframites may be mentioned a large exhibition specimen of the pure granular wolframite from near Lead, South Dakota, where this mineral occurs in a unique manner as a bedded replacement of dolomitic limestone. This specimen (Cat. 90586) is from the Hidden Treasure mine and is a gift of the Homestake Mining Co.

The mineral ferberite, the pure iron end member of the wolframite series, is represented in the collection by a complete series of the Boulder County, Colorado, ores, showing all the varieties and associations of both crystallized and massive ferberite ore. One specimen recently received (Cat. 90591) from this district shows ferberite associated with abundant gold tellurides. A specimen of ferberite from near Soldier, Idaho (Cat. 89119), received through Mr. V. C. Heikes, bears a remarkable resemblance to the Colorado ores.

Hubnerite, the manganese end member of the wolframite series, is also well represented by large and fine specimens, especially noteworthy being one from the Tungstonia mine, White Pine County, Nevada (Cat. 90274), and several specimens showing blades up to several inches in length of bronzy hubnerite in white quartz from the Blue Wing District, Lemhi County, Idaho (Cat. 88123). The latter specimens were received from Messrs. C. H. Hussey, M. S. Duffield, and F. L. Woods.

A rare and unique tungsten ore is a large specimen of the newly discovered mineral tungstenite, a tungsten sulphide recently described from the Emma Consolidated mine, at Alta, in Little Cottonwood Canyon, Utah.[1] This specimen (Cat. 90402) is the gift of Mr. William Garrett Ridgley, of New York City. It shows a large mass of the soft gray tungstenite, which resembles fine-grained molybdenite, intimately mixed with pyrite, galena, and tetrahedrite.

The series of tungsten ores exhibited is in all probability the finest and most complete of its kind in the world, and is especially valuable, since it contains all of the types which were recently used as the basis of a profusely illustrated treatise on Tungsten Minerals and Deposits by Mr. Hess.[2]

Molybdenum is a metal which is similar to tungsten in its properties and also in the effect which it has upon the physical properties of steels, with which it is alloyed. Indeed, molybdenum is said to be more efficient than is tungsten for many of the same purposes, but owing to its greater rarity and consequent higher price it is much less generally used. The ores of molybdenum are less numerous than are those of tungsten, the most important being the sulphide, molybdenite, which is a soft scaly gray mineral resembling graphite. Les important ores are molybdite, a hydrous ferric molybdate which occurs as a yellow powder resembling tungstite, and wulfenite, lead molybdate, which forms tabular yellow to orange crystals. The series of molybdenum ores now exhibited is very complete; al varieties of the ores and all important localities are abundantly represented. Among important recent accessions may be mentioned a large specimen of molybdenite from the Climax Molybdenum Co.'s mine, Climax, Colorado (Cat. 90562), and a large amount of unusually pure molybdite (Cat. 90761) from the same locality. Several very large masses of molybdenite were recently received from the R. and S. Molybdenum Co.'s mine in Taos County, New Mexico (Cat. 90738).

Vanadium is another of the metals important in alloy steel manufacture. Perhaps one of the most valuable and unique sets of ores in the exhibition series is the collection of vanadium ores from Minasragra, Peru (Cat. 89897–89905), collected for the museum by Mr.

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[1] R. C. Wells and B. S. Butler, Journ. Washington Academy Sci., vol. 7, pp. 596–599, 1917.

[2] Frank L. Hess, U. S. Geological Survey, Bulletin 652, 1917.

D. Foster Hewett. These deposits, as described by Mr. Hewett,[1] consist of veins filled with the hitherto unknown minerals quisqueite, a lustrous black sulphur-bearing hydrocarbon, a natural coke, patronite, a black vanadium sulphide, and bravoite, a nickeliferous variety of pyrite. Near the surface these ores have largely oxidized, yielding secondary vanadium compounds, chief among which are hewettite and pascoite, hydrous calcium vanadates. Fine large specimens of all of the minerals of the ore are included in the exhibition series. Since being preserved in the collections many of the specimens of patronite have become coated with the green sulphate of vanadium minasragite.

A series of vanadium ores (Cat. 90431–90434) from the United States Vanadium Development Co.'s mines near Kelvin, Arizona, donated by Maj. H. S. Bryan, shows crusts of fine red vanadinite and brown to black descloizite coating limestone. Several very large and fine specimens of the vanadiferous sandstone from Colorado have recently been received.

Aside from the steel-making metals, some fine specimens of antimony, bismuth, and rare earth metal ores have been received. Messrs. Root and Simpson, assayers of Denver, Colorado, recently sent to the museum an unusually large and fine specimen of the rare lead sulphostannate cylindrite from Bolivia.

Among recently acquired additions to the saline collections is a series of large specimens of sodium salts from the Pintados Salar, Tarapaca, Chile, collected by Mr. Hoyt S. Gale. This large salt deposit in the Chilean desert consists of an upper hummocky layer of irregular blocks of sodium chloride, the crust having been broken and heaved upward by the crystallizing force of the underlying bed, which consists of thenardite or anhydrous sodium sulphate. Mr. Gale has also contributed some beautifully banded specimens of red and white potassium and sodium chlorides from the Amelie Mine, Alsace. These specimens are very showy and illustrate the seasonal variations in the deposition of the salts.

Among other materials recently received are large numbers of sets of rocks and ores of various American mining districts transferred by the United States Geological Survey. Much material from the Panama-Pacific Exposition has recently been unpacked and found to contain extensive series of Australian, Bolivian, Brazilian, and Japanese ores. A series of Japanese ores and rocks is being prepared for exhibition as a unit. Other series from this material to be placed on exhibition include a set of uranium-vanadium ores from Utah, showing the minerals carnotite, volborthite, and calciovolborthite in sandstone, and a suite of ores from Huitzuco, Mexico, showing the association of stibnite, gypsum, and native sulphur, with the rare mercury ores, livingstonite, barcenite, and ammiolite.

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[1] Hewett, D. F., Trans. Amer. Inst. Min. Eng., 1909, p. 291.

THE NORTH AMERICAN ICHNEUMON-FLIES OF THE TRIBE EPHIALTINI.

By R. A. Cushman,

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INTRODUCTION.

This paper is a further contribution to a revision of the subfamily (Pimplinae) Ichneumoninae undertaken by Mr. S. A. Rohwer and the writer. It treats of the tribe Ephialtini as defined by Cushman and Rohwer in the first paper of the series.[1]

The drawing of *Ephialtes* (*Itoplectis*) *conquisitor* (Say) is by Miss Mary Carmody and the photographs by Mr. J. H. Paine, both formerly of the Bureau of Entomology, United States Department of Agriculture.

Tribe EPHIALTINI, Cushman and Rohwer.

In the Nearctic fauna, and indeed in that of the Holarctic region, this tribe includes only two genera, *Ephialtes* Schrank,[2] with its subgenus *Itoplectis* Foerster, and *Apechthis* Foerster. In other regions, notably the oriental region, there are other genera referable to this tribe. All of these genera have heretofore been referred to the tribe (Pimplini) Ichneumonini.

So far as their host relations are known the members of this tribe are internally parasitic in lepidopterous pupae.

Description.—Head thin antero-posteriorly, the temples strongly sloping toward the occipital carina, the latter complete; frons concave; eyes sinuate to sharply emarginate opposite antennae; mandibles bidentate, the teeth equal in length; antennae from long filiform to subclavate; pronotum very short dorsally, the head set very close to the prescutum; thorax stout, ovate; mesoscutum with or without notauli, but the prescutum short, not extending far before the lateral lobes, notauli when complete converging posteriorly, deep and pitlike anteriorly, where they are bounded by a sharp carina that runs backward along the lateral margin of the lateral lobe; lateral carinae of mesoscutum strong posteriorly and extending more or less on to scutellum, the latter broad and weakly convex; mesoplural furrow curved or straight, not angulate opposite the punctiform fovea; propodeum in profile declivous from near base, with or without closed areas (in Holarctic genera without); legs usually stout, apical tarsal joint long, curved, claws simple, in female sometimes with basal tooth on some or all legs; wings with areolet always present, oblique quadrangular, nervellus reclivous and broken far above middle or the submediella is interstitial with its upper extremity; abdomen sessile, broadly fusiform, depressed; first tergite broad and with strong dorsal carinae, the anterior basin deeply concave; middle tergites transverse to quadrate, lateral elevations weak or absent; ovipositor short, stout, cylindrical, awl-like, usually straight, though sometimes sharply decurved at extreme apex, the lance dorsally without subapical notch or angulation, either flattened at apex or with its dorsal margin decurved, the ventral margin of lancets curving upward toward apex, the extreme apex rather obtuse.

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[1] Cushman and Rohwer, Proc. U. S. Nat. Mus., vol. 57, 1920, pp. 379–396.

[2] (= Pimplidea Viereck) not *Ephialtes* Gravenhorst. The reasons for this change are fully set forth by Cushman and Rohwer, Proc. Ent. Soc. Wash., vol. 20, No. 9, 1918 (1919), pp. 186–188.

The robust form, with the rather small, almost lenticular head; the short pronotum, which places the head close against the prescutum; the stout, ovate thorax; the mesoscutum, which, even when the notauli are strong, can hardly be said to have its anterior margin trilobed; the sloping propodeum; stout legs; broad, depressed abdomen; and short, thick, cylindrical ovipositor combined produce a habitus that once learned is very easy to recognize.

The insects of this tribe are most likely to be confused with the Ichneumonini, though it is doubtful if the two tribes are very closely related. Certain of the exotic genera, notably *Xanthopimpla* Saussure, approach the Theroniini in some of their characters, especially in the areolation of the propodeum, and this tribe is probably the closest relative of the Ephialtini.

The two genera found in the restricted region embraced in this paper are very readily distinguished by the characters used in the following key:

KEY TO NORTH AMERICAN GENERA.

Radius originating from behind middle of stigma; face usually strongly, densely punctuate and usually wider than long, without orbital maculation, in male not different from female; scutellum and postscutellum usually immaculate apically; ovipositor straight at tip; claws in female (except sometimes the front ones) without basal tooth; first tergite longer than second ....*Ephialtes* Schrank.

Radius originating at or before middle of stigma, face polished, weakly, sparsely punctate and usually longer than wide, with yellow orbital maculation, the latter in male frequently embracing the entire face; scutellum and usually postscutellum maculate apically; ovipositor abruptly decurved at tip; claws in female (at least front and middle ones) with basal tooth or lobe; first and second tergites subsequal in length..*Apechthis* (Foerster).

Genus EPHIALTES Schrank.

From *Apechthis*, *Ephialtes* is amply distinct by the strongly punctate, immaculate face; the longer first tergite; the straight ovipositor; and the lack of the basal tooth on the claws in the female except sometimes on the front tarsi.

All of the characters employed in the following key for the separation of the two subgenera are subject to great variation, so much so that no one character can be used to place a species in its subgenus. The combinations of long malar space with nonemarginate eyes for *Ephialtes* and short malar space with deeply emarginate eyes for *Itoplectis* form perhaps the best characters for the separation of the two subgenera, but can not be depended on unsupported by other characters. The inner margin of the eye varies from nearly straight to deeply emarginate, the malar space from a fourth as long as the basal width of the mandible to slightly longer, the clypeus from truncate or even slightly rounded to deeply emarginate at apex, the propodeal spiracle from round to very long oval, the position of the antennal foramina from distinctly above to distinctly below the middle of the eye, the front tarsal claws in the female from strongly lobed to simple, and so on through the whole list of possible characters, but the characters are not grouped in the same manner in all species belonging to a given subgenus, and the variation in each character is so gradual from species to species that it is difficult, if not impossible, to draw a line of demarkation at any point in the variation.

The male is more slender than the female; the antennae are stouter; the malar space shorter; the clypeus less deeply emarginate in those species having it at all emarginate in the female; and not even the front tarsal claws toothed basally.

KEY TO SUBGENERA.

Malar space at least half as long as basal width of mandible, shorter in male than in female; inner margin of eye usually broadly curved, not deeply emarginate; clypeus subtruncate to deeply emarginate at apex; lower margin of antennal foramina at or below middle of eye; frons deeply concave; antennae long, filiform, frequently attenuate at apex; notauli usually feebly indicated anteriorly; propodeum long, with lateral ridges strong, spiracle usually elongate; intercubitella usually less than half as long as basal abscissa of radiella; hind tibiae usually not annulated, the tarsi never annulated; apical spines of tarsal joints very long, those of the fourth joint of front tarsus reaching to or beyond middle of fifth joint, not especially long in male; claws of front tarsi in female without basal lobe............*Ephialtes* Schrank.

Malar space rarely half as long as basal width of mandible, usually much shorter; inner margin of eye deeply emarginate; clypeus truncate to broadly rounded at apex; lower margin of antennal foramina above middle of eye; frons usually not deeply concave; antennae usually not long, usually more or less thickened toward apex and attenuate at base; notauli usually not at all indicated; propodeum usually short, declivous from base, lateral ridges usually weak, spiracles usually round or short oval; intercubitella usually more than half as long as basal abscissa of radiella; hind tibiae and tarsi usually annulated; apical spines of tarsal joints short, those of the fourth joint of front tarsus not reaching middle of fifth joint; claws of front tarsi in female with more or less distinct basal lobe.......................... *Itoplectis* (Foerster).

Subgenus EPHIALTES Schrank.

Ephialtes SCHRANK, Fauna Boica, vol. 2, pt. 3, 1802, p. 316, (not Gravenhorst. 1829). Type, *Ichneumon compunctor* Linnaeus (=*Pimpla instigator* Fabricius.

Pimpla Authors, part.

Pimplidea VIERECK, Bull. 83, U. S. Nat. Mus., 1914, p. 117. (New name for *Pimpla* Authors, not Fabricius). Type, *Pimpla pedalis* Cresson.

KEY TO NORTH AMERICAN SPECIES.

1. All legs, except yellowish mark on prothoracic, black to piceous (hind legs sometimes red, especially in male).. 2.
   Legs mostly reddish.. 3.
2. Abdomen black; scutellum with yellow spot; wings blackish; malar space barely half as long as basal width of mandible................*maura* (Cresson).
   Abdomen red; scutellum black; wings hyaline; malar space distinctly more than half as long as basal width of mandible.............*ellopiae* (Harrington).
3. Coxae black.. 4.
   Coxae red.. 5.
4. Apical half of hind tibiae and their tarsi fuscous..................*sodalis* (Ruthe).
   Hind tibiae and tarsi entirely red........................*longigenalis* Cushman.
5. Front tibiae in female increasing gradually in size from base to apex; first tergite with a more or less prominent elevation each side of middle; hind tibiae black without a trace of annulation..................................*pedalis* (Cresson).
   Front tibiae in female swollen in middle...................................... 6.
6. Hind tibiae red or blackish, not or but obscurely annulated, with reddish or whitish.. 7.
   Hind tibiae black with a distinct white annulus.......................... 10.
7. Hind tibiae in female in lateral view increasing gradually in size from base to apex.. 8.
   Hind tibiae in female in lateral view with a distinct though slight swelling between middle and base.. 9.
8. Legs slender; hind tibiae blackish with a fairly distinct reddish annulus, their spurs white; both maxillary and labial palpi white (male only known) *yakutatensis* (Ashmead).
   Legs stout; hind tibiae usually entirely red, sometimes infuscated and rarely with a very obscure annulus, the spurs reddish or fuscous; at least the labial palpi blackish or piceous..................................*sanguineipes* (Cresson).
9. Hind tibiae entirely red; palpi and tegulae white..........*punicipes* (Cresson).
   Hind tibiae fuscous, with an obscure reddish annulus near base; palpi and tegulae piceous...*exareolata* (Ashmead).
10. Abdomen finely punctate, the tergites without definite polished apices; scutellum in male white marked (female unknown)............*aquilonia* (Cresson).
    Abdomen rather coarsely punctured, the tergites with apices polished, scutellum in male not white marked.. 11.
11. Front tibiae in female not at all excavated beyond middle; only the hind tibiae annulated; tegulae black; front coxae black to piceous, darker in male *tenuicornis* (Cresson).
    Front tibiae in female more or less deeply excavated below middle; both hind and middle tibiae usually annulated; tegulae usually white; front coxae testaceous...*aequalis* (Provancher).

EPHIALTES (EPHIALTES) MAURA (Cresson).

Pimpla maura CRESSON, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 143, female.

Type.—Acad. Nat. Sci. Phila., No. 1413.

In the United States National Museum is a female of this species from the Belfrage Texas collection. This specimen has been compared by the writer with the type, from which it differs practically only in being somewhat smaller and in having the propodeum with the carinae, transverse regosity, and lateral angulations less strongly developed. The very dark-colored legs with the pale markings of the front femora and tibiae are characteristic of a small group of species which includes also the next following species and two from Japan (*Pimpla pluto* Ashmead and *Pimpla parnarae* Viereck). Another rather conspicuous character that all have in common is the dorsally prominent eyes, the top of the eyes being elevated above the level of the vertex. The present species is very distinct from all other North American species in its almost entirely black color.

Other characteristics are clypeus broadly subtruncate and with a narrow, reflexed, crenulate flange at apex; malar space barely half as long as basal width of mandible; eyes very large, the head in front view being much wider than long, inner margins of eyes deeply sinuate; lower margins of antennal foramina below middle of eye; face and vertex equal in width, the latter slightly below level of top of eyes; front rather shallowly concave, ruguloso-punctate; diameter of lateral ocellus equal to length of ocell-ocular line, and much shorter than postocellar line; notauli briefly, broadly impressed; propodeum transversely rugulose above, reticulate punctate apically, polished behind, spiracles broadly oval; dorsal carinae of first tergite subobsolete; nervulus distinctly postfurcal.

All specimens known to the writer are from Texas.

EPHIALTES (EPHIALTES) ELLOPIAE (Harrington).

Pimpla ellopiae HARRINGTON, Can. Ent., vol. 24, 1892, p. 99, female, male.

Type.—Coll. W. H. Harrington, Ottawa, Canada.

Five specimens, four females and one male, of this species in the United States National Museum agree in practically every particular with descriptive notes on the type by S. A. Rohwer. The females vary from 10 mm. to 13 mm. in length, while the type is but 9.5 mm.

In the type the abdomen is 6 mm. long and the exserted portion of the ovipositor 3 mm.; in the largest of the National Museum specimens the abdomen is 8 mm. and the ovipositor 3.5 mm. In the latter specimen the hind femora are piceous, becoming almost red within and at the base. The smallest of the National Museum specimens has the abdomen and ovipositor as in the type and the femora red except where they are piceous. A specimen in the

Academy of Natural Sciences of Philadelphia has been examined by the writer. It is also larger than the type and differs also in having the abdomen becoming nearly black at the apex, wings yellowish hyaline, hairs of face longer and more yellowish, ovipositor slightly less than half as long as abdomen. According to Mr. Rohwer's notes, the type male differs from the female but little beyond the more reddish legs and the more hairy head and thorax. The only male in the National Museum differs from the female in the same way and also has the tegulae whitish basally.

Other characters of the female worthy of mention are: Clypeus broadly, rather deeply emarginate; malar space about three-quarters as long as basal width of mandible; eyes broadly arcuate within; face broader than vertex, the latter below level of top of eyes; diameter of lateral ocellus nearly twice as great as ocellocular line and nearly as long as postocellar line; lower margin of antennal foramina below middle of eye; front deeply concave and transversely rugulose; antennae nearly as long as body, very slender, not attenuate at apex; notauli briefly, rather deeply impressed; propodeum strongly transversely rugose above, ruguloso-punctate laterally, polished behind, spiracle long oval; dorsal carinae of first tergite obsolete, their positions occupied by broad polished areas. The types are from British Columbia, where they were reared from *Ellopia somniaria* and the National Museum specimens are from California, one female collected by H. S. Barber in Humboldt County and the rest collected by W. M. Mauer at Pacific Grove.

EPHIALTES (EPHIALTES) SODALIS (Ruthe).

Pimpla sodalis RUTHE, Stettin. Ent. Zeit., vol. 20, 1859, p. 371, female, male.
Pimpla nordenskioldi HOLMGREN, Oefvers. Svensk., Vet.-Akad. Forh., vol. 29, pt. 6, 1872, p. 97, female.
Pimpla longiceps THOMSON, Opusc. Ent., pt. 8, 1877, p. 746, 1877, female, male.

This species, with which Roman [1] synonymizes *nordenskioldi* Holmgren, has been recorded under the latter name from Greenland by Holmgren in his original description and by Aurivillius [2]. It differs from all the other North American species of Pimplidea in having the coxae black and the legs otherwise mostly red, being allied in this respect to *instigator* Fabricius of Europe. No specimens of the species are available for examination.

Distribution.—Northern Europe, Iceland, Greenland.

EPHIALTES (EPHIALTES) LONGIGENALIS, new species.

Apparently very closely related to *sodalis* (Ruthe), differing from descriptions of that species only in having the hind tibiae and tarsi entirely red. Because of this difference it runs in Schmiedeknecht's key[1] to 17, where it agrees with neither *instigator* (Fabricius) nor *aegpytiaca* (Schmiedeknecht).

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[1] Naturh. Untersuch, des Sarekgebirges, vol. 4, 1909, p. 268.

[2] Bih. Svensk. Vet.-Akad. Handl., vol. 15, pt. 4, No. 1, 1890, p. 29.

Female.—Length, 8 mm.; antennae, 7 mm.; ovipositor, 2.6 mm.

Head rather broad behind eyes, the temples straight and not sharply converging, sparsely, weakly punctate; frons weakly, transversely striate; face with a median longitudinal ridge; clypeus truncate at apex; malar space slightly longer than basal width of mandible. Thorax shining; pronotum, mesopleura posteriorly and metapleura striate; mesopleura otherwise, mesoscutum and scutellum obscurely punctate; propodeum dorsally rugoso-punctate, posteriorly transversely rugose, median carinae divergent; first tergite shallowly concave at base; basal five tergites densely punctate with broad, polished, subcallose apices; apical tergites subpolished; ovipositor about half as long as abdomen.

Brilliant black; this color embracing coxae, trochanters, antennae, tegulae and base of costa; legs otherwise bright rufotestaceous; wings fuscous, venation dark brown.

Type locality.—Tuolumne Meadows, California, 8,600 feet.

Type.—Cat. No. 22871, U. S. N. M.

Described from two females collected by G. R. Pilate, the type on August 15, 1916, and the paratype on August 8, 1916.

The paratype is practically identical with the type, being very slightly larger and having the ovipositor relatively slightly longer.

EPHIALTES (EPHIALTES) PEDALIS (Cresson).

Pimpla pedalis CRESSON, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 268, male.

Pimpla pedalis WALSH, Trans. St. Louis Acad. Sci., vol. 3, pt. 1, 1873, p. 132, female, male.

Pimplidea pedalis (Cresson) VIERECK, Bull. 83, U. S. Nat. Mus., 1914, p. 117.

Scambus (*Pimplidea*) *pedalis* VIERECK, Hym. Conn., 1917, p. 320.

Type.—Acad. Nat. Sci. Philadelphia, No. 1411.

This species is among the most common of the Eastern *Ephialtes*. Its usually large size, brilliant black color, and black hind tibiae and tarsi without any trace of annulation will serve to distinguish it from any other species. Its nearest relative appears to be the Alaskan *yakutatensis* (Ashmead), this species resembling it in the slender legs and the stucture of the first tergite, but being distinct from it in the obscurely annulated hind tibiae. *Yakutatensis* is known only in the male, and it is impossible, therefore, to compare the females of the two species. In the female it differs from all the other species of the subgenus in the formation of the front tibiae, these being not at all swollen in the middle but slender and increasing gradually in size from base to apex.

Other characters of value are: Clypeus broadly, very shallowly emarginate; malar space in female equal in length to basal width of mandible; face and vertex subequal in width; eyes sinuate within; lower margin of antennal foramina below middle of eye; antennae very long and slender, slightly attenuate toward apex; frons deeply concave, transversely rugose medially; diameter of lateral ocellus equal to ocellocular line and slightly more than half as long as postocellar line; notauli very broadly, shallowly indicated in front; propodeum transversely rugulose above, reticulate punctate laterally, polished posteriorly, spiracle long oval to broad oval, depending on size and sex; scutellum weakly convex, subtruncate at apex; nervulus postfurcal.

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[1] Opusc. Ichn., fasc. 13, 1906, p. 1022.

In the male the clypeus is truncate rather than emarginate; malar space about two-thirds as long as basal width of mandibles; face slightly narrower than vertex; and the sculpture and impressions of the abdomen stronger than in female.

In the 14 females at hand there is comparatively little variation in size or structure. The largest is 16 mm. long, with abdomen 9.5 mm., exserted portion of ovipositor 4 mm. The smallest has the corresponding measurements, 12 mm., 7 mm., and 3.5 mm. Among the 25 males the variation in size is much greater, the largest being 14.5 mm. and the smallest 7.5 mm. long. In the smaller specimens the propodeal spiracle is relatively much broader than in the larger specimens.

Distribution.—Specimens in National Museum from Nova Scotia, New Hampshire, Massachusetts, New York, Pennsylvania, Michigan, Wisconsin, Minnesota, Vancouver, Washington, California, New Mexico, Virginia, Colorado.

Hosts.—The reared specimens in the United States National Museum are from the following hosts: *Leucania unipuncta, Orgyia badia, Malacosoma disstria*, and *Olene pinicola*. Other host records gleaned from literature are as follows: Galls of *Saperda concolor*,[1] *Heterocampa guttivitta*,[2] gypsy moth (*Porthetria dispar*),[3] *Pyrrharctia isabella*,[4] *Tortrix fumiferana*.[5] In the case of the last record Fernald states that the parasites must oviposit in the host larva, for the material from which they came was received as larvae. Bruner[6] noted the same phenomenon, the host in this case being *Malacosoma disstria*.

EPHIALTES (EPHIALTES) YAKUTATENSIS (Ashmead).

Pimpla yakutatensis ASHMEAD, Proc. Wash. Acad. Sci., vol. 4, 1902, p. 200, male. Type, Cat. No. 5621, U.S.N.M.

Besides the unique type there are in the United States National Museum four other males of this species, all from Alaska, but no females. It is probably more closely allied to *pedalis* (Cresson) than to any other North American species. It can, however, be easily distinguished from that species by its annulated hind tibiae, white tibial spurs, and white palpi. The apparently best characters for separating it from *sanguineipes* (Cresson) have been made use of in the key, though the variation in both species with reference to all but the first character, which is comparative, makes the separation difficult.

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[1] Davis, Ins. Life, vol. 4, p. 66.

[2] Patch, Miss E. M., Me. Expt. Sta. Bull. 162, p. 365.

[3] Ins. Life, vol. 5, p. 339.

[4] Fiske, Tech. Bull. 6, N. H. Expt. Sta., p. 201.

[5] Fernald, Rept. on Gypsy Moth, p. 377.

[6] Neb. Expt. Sta. Bull. 14, p. 29-32.

Other characters of the male are: Clypeus broadly, shallowly emarginate at apex; malar space half as long as basal width of mandible; inner margin of eye weakly sinuate; lower margin of antennal foramen slightly below middle of eye; front rather weakly concave; antennae long, slightly attenuate at apex; notauli feeble; propodeum without lateral ridges, rugulose punctate above, punctate laterally, polished behind, spiracle very broadly oval.

EPHIALTES (EPHIALTES) SANGUINEIPES (Cresson).

Pimpla sanguineipes CRESSON, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 165, female. Type, Cat. No. 12277, U.S.N.M.

Pimpla (*Pimpla*) *erythropus* VIERECK, Ent. News, vol. 20, 1909, p. 291, female, male. Type, Cat. No. 12275, U.S.N.M.

Of the two characters mentioned by Viereck in his description of *erythropus*, as distinguishing it from *sanguineipes* (the smooth, polished posterior face of the propodeum with its surrounding carina and the color of the wings), the latter is obviously of no value, since the wings of the type of *sanguineipes* are distinctly brown-stained. As for the propodeal character, I know of no species in the genus in which this is not subject to marked variation. The "carina" surrounding the posterior polished area is formed by the strengthening and completion medially of one of the numerous transverse rugae. In the type of *sanguineipes* the rugae cover most of the posterior face of the propodeum and none is especially strong. In the type of *erythropus* the reverse is true. But other specimens show intermediate structure, and one of Viereck's paratype females has the posterior face strongly rugose, while the "carina" is unusually strong.

The most striking characteristic of this species is its sharply contrasting, intensely black body and almost entirely bright red legs. Other characters of value are: Clypeus broadly emarginate at apex; malar space in female equal in length to base of mandible, slightly shorter in male; face in female slightly wider than, in male equal to, vertex; diameter of lateral ocellus much shorter than ocell-ocular line, the latter nearly as long as postocellar line; frons deeply concave up to anterior ocellus, usually more or less transversely rugulose, in male concavity less deep and not extending up to ocellus; eyes only slightly sinuate within; notauli barely indicated anteriorly; scutellum weakly convex, subtruncate at apex, propodeum strongly ridged laterally in female, not at all in male, rugulose dorsally, reticulate punctate laterally, polished behind, spiracle long oval to broadly oval; nervulus interstitial or slightly postfurcal.

In the rather large series in the United States National Museum is exhibited a wide range of variation in size, structure, and sculpture, and some in color. Females vary in size from 14 mm. to 5 mm. and males from 12 mm. to 7 mm. The smaller specimens have the head thicker from front to back, the thorax shorter, sculpture weaker, and wings paler (sometimes nearly hyaline) than in the larger specimens. In some specimens the middle tergites have their apices and posterior corners reddish. A few of the smaller specimens have the hind tibiae strongly infuscated, some displaying a very obscure and poorly defined annulation. The shortening of the thorax is especially noticeable in the mesoscutum, this being distinctly longer than wide in large specimens and distinctly wider than long in very small specimens

In addition to the type from Texas and the type series of *erythropus* from various localities in California, specimens of this species from the following States and Provinces are in the National Museum: British Columbia, Washington, Oregon, California, New Mexico, Texas, Colorado.

Hosts.—*Spilosoma virginica* (Colorado), *Hemileuca maia* (New Mexico, Webster No. 5054), *Malacosoma fragilis* (New Mexico), *Laspeyresia pomonella* (California, Bur. Ent. No. 235), *Sabulodes anfractata* (California, Bur. Ent. No. 850), *Notolophus oslari* (California, Hopkins U. S. Nos. 4449*e*, e^3, e^5, and e^6, types of *erythropus* Viereck).

EPHIALTES (EPHIALTES) PUNICIPES (Cresson).

Pimpla punicipes Cresson, Proc. Acad. Nat. Sci. Phila., 1873, p. 398, female. Type in Acad. Nat. Sci. Phila., No. 604. Cotype in U. S. Nat. Mus.

This species, described from Mexico, is included in the present paper on the strength of a determination of a Texas specimen by Cresson. This specimen is in the Academy of Natural Science of Philadelphia. The species, as represented by the National Museum cotype, is very closely related to *sanguineipes* (Cresson) and *exareolata* (Ashmead), being distinguished from the very small specimens of the former species and from the unique type of the latter principally by the characters used in the key. The form of the hind tibia in this and in *exareolata*, though not conspicuous, is apparantly very characteristic. Other characters of value are: Clypeus truncately emarginate at apex, malar space as long as basal width of mandible; inner margin of eye slightly sinuate; face as broad as vertex; lower margin of antennal foramen far below middle of eye; front rather shallowly concave, polished, weakly rugulose medially; ocell-ocular line slightly longer than diameter of lateral ocellus; antennae nearly as long as body, not attenuate at apex; notauli not at all impressed; propodeum very weakly ridged laterally, densely punctate dorsally and laterally, polished behind, spiracle practically round; first tergite with posterior depression occupying much more than half the length of the tergite, not roundly prominent on each side of middle at summit; ovipositor sheath about one-third as long as abdomen.

EPHIALTES (EPHIALTES) EXAREOLATA (Ashmead).

Itoplectis exareolata ASHMEAD, Psyche, vol. 9, 1901, p. 147, female. Type, Cat. No. 5326, U.S.N.M.

This species is represented only by the unique type female. In addition to the characters given in the key it differs from its nearest relative, *puncipes* (Cresson), in having the clypeus distinctly emarginate; first tergite with anterior declivity occupying but little more than half of the length of the tergite, and roundly elevated on each side of the middle at the summit; ovipositor sheath about half as long as abdomen.

EPHIALTES (EPHIALTES) AQUILONIA (Cresson).

Pimpla aquilonia CRESSON, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 145, male. Type, Acad. Nat. Sci. Phila., No. 1421.

This species, described only in the male, is evidently most closely allied to *aequalis* (Provancher) of the North American species, but differs from that species by the white spotted scutellum and more finely sculptured abdomen. The latter character is, however, very variable in *aequalis*. These two characters ally it much more closely to *turionellae* (Linnaeus) of Europe.

The unique type is apparently the only specimen known. It is from Maine. The record published by Davidson[1] of the rearing of this species from spider egg cocoons is of doubtful accuracy. He undoubtedly had a species of *Tromatobia*.

EPHIALTES (EPHIALTES) TURIONELLAE (Linnaeus).

Ichneumon turionellae LINNAEUS, Syst. Nat., ed. 10, vol. 1, 1758, p. 564, male.
Pimpla turionellae GRAVENHORST, Nov. Act. Acad. Nat. Curios., vol. 9, 1818, p. 291.

Roman[2] records this species from New Jersey, Wisconsin, Illinois, South Carolina, and Texas. The only closely allied North American species that has any such distribution is *aequalis* (Provancher), and it seems most likely that this is what Roman had, especially since his observations on the structure of his specimens apply fairly well to this species.

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[1] Ent. News, vol. 7, p. 319.

[2] Ent. Tidskr., vol. 31, 1910, p. 187.

EPHIALTES (EPHIALTES) TENUICORNIS (Cresson).

Pimpla tenuicornis Cresson, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 267, female. Type, Acad. Nat. Sci. Phila., No. 1414.
Meniscus marginatus Provancher, Nat. Can., vol. 14, 1883, p. 15, female. Type, Derniere Provancher coll., Public Mus. Quebec.
Meniscus ashmeadii Provancher, Addit. Faun. Can. Hym., 1888, p. 430, female. Type, Derniere Provancher coll., Public Mus. Quebec.
Scambus (*Itoplectis*) *tenuicornis* Viereck, Hym. Conn., 1917, p. 322.
Pimplidae tenuicornis Cushman, Proc. Ent. Soc. Wash., vol. 20, 1918, p. 9-10.

The synonmy of this species has been discussed in a recent paper by the writer (see reference above), and in that place as well as under the following discussion of *aequalis* (Provancher) its very close relationship to the latter species has been outlined. For the characters separating these two species see the synoptic table and discussion under *aequalis*.

Distribution.—Canada from Nova Scotia to Vancouver, northern tier of States, and extending south to Colorado and New Jersey. The following States and Provinces represented in National Museum; New Brunswick, Nova Scotia, Vancouver, New Hampshire, Vermont, Massachusetts, New York, New Jersey, Michigan, Illinois, Colorado.

Hosts.—Gypsy moth (*Porthetria dispar*)[1]; *Sesia caudata*.[2]

EPHIALTES (EPHIALTES) AEQUALIS (Provancher).

Pimpla annulipes Authors, not Brullé.
Pimpla aequalis Provancher, Nat. Can., vol. 12, 1880, p. 36, female. Type, Derniere Provancher coll., Public Mus. Quebec.
Pimpla conquisitor, var. *rufuscula* Davis, Trans. Amer. Ent. Soc., vol. 24, 1897, p. 368, female. *Type*, Acad. Nat. Sci. Phila.
Scambus (*Itoplectis*) *marginatus* Viereck, Hym. Conn., 1917, p. 322.
Pimplidea aequalis Cushman, Proc. Ent. Soc. Wash., vol. 20, 1918, pp. 9–10.

In a recent paper (see reference above) the writer has discussed the snyonymy and immediate relationship of this species and recapitulation here is unnecessary. This discussion and the following description is based on the types of both Provancher and Davis, specimens compared with both types, and a very large series of both sexes in the United States National Museum.

Malar space equal to basal width of mandible in female, slightly shorter in male; face slightly wider than vertex; antennae nearly as long as body, very slender and slightly attenuate toward apex, the lower margins of their foramina far below middle of eye; frons rather deeply concave, especially in large specimens, polished with few weak rugae in large specimens; ocelli subequal in diameter to length of ocell-ocular line, which is considerably shorter than postocellar line; propodeum with lateral ridges weak, strongly punctate laterally, polished medially and posteriorly, with more or less transverse rugosity separating posterior from dorsal surface; the spiracles round to broad oval; first tergite with dorsal carinae obsolescent, the anterior face nearly flat; not elevated on each side of middle at summit.

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[1] Ins. Life, vol. 5, p. 339.

[2] Ins. N. J., 1909, p. 626.

Very closely allied to *tenuicornis* (Cresson) and possibly synonymous with that species. Practically all of the characters separating the two have been listed in the key, and *aequalis* varies in all of these toward *tenuicornis*. The front tibiae in the female vary from deeply excavated to nearly straight below; the middle tibiae vary from distinctly white annulate to entirely red; the tegulae are frequently brownish at apices; and the front coxae are sometimes piceous at base. In size the females in the United States National Museum vary from 4.5 mm. to 13 mm. and the male from 3.5 mm. to 10 mm. Normally the abdomen is black with the apices of the tergites narrowly piceous, but some specimens have the piceous bands broadening out at each side to include a broad lateral space, and in some of the reared specimens the abdomen is entirely brownish with the apices of the tergites slightly paler.

There is some variation in the length of the malar space, relative width of face and vertex, concavity of frons, and diameter of ocelli with respect to length of ocell-ocular line. In some specimens the transverse rugosity of the propodeum amounts almost to a carina and there are two well-defined longitudinal carinae, these elevations setting off a dorsal and a posterior polished area.

Distribution.—New Brunswick to Wisconsin, south to New Mexico and Florida, the National Museum containing specimens from the following States: New Hampshire, Massachusetts, New York, New Jersey, Pennsylvania, Maryland, District of Columbia, Virginia, West Virginia, Georgia, Florida, Alabama, Louisiana, Arkansas, Texas, New Mexico, Kansas, Nebraska, Missouri, Colorado, Wisconsin, Michigan, Illinois, and Indiana, in addition to one from New Brunswick and many labeled simply Canada.

Hosts.—Synanthedon pictipes; *Alabama argillacea; Mineola juglandis; Laspeyresia pomonella; Proteropteryx bolliana; Recurvaria nanella; Euzophera semifuneralis.* The above host records are found in the National Museum series. Dalla Torre lists the following under *Pimpla annulipes: Acrobasis* (*Mineola*) *juglandis*, *Carpocapsa pomonella* (*Phycita nebulo*), *Mineola indigenella*, *Papilio ajax*, *Datana ministra*, *Tortrix quercifoliana*, *Teras* (*Acleris*) *oxycoccana Heterocampa marthesia*, *Gelechia* (*Gnorimoschema*) *gallaeasterella*, all on the authority of Riley; *Chlorippe clyton*? and *Iphiclides ajax*, on authority of Howard; and *Crambus exsiccatus*, quoting Weed.

Subgenus ITOPLECTIS (Foerster) Woldstedt.

Pimpla AUTHORS, in part.

Itoplectis (Foerster) WOLDSTEDT, Vehr. naturh. Ver. preuss. Rheinland, vol. 25, 1868, p. 111; Bull. Acad. Imp. Sci. St. Petersbourg, vol. 10, 1877, p. 16, separate. Type, *Pimpla maculator* (Fabricius).

The original description of *Itoplectis* consists of the characters used by Foerster in his key to the genera. He did not include any species, nor were there any included until 1877, when Woldstedt placed two species in the genus. One of these, *maculator* Fabricius, was designated by Viereck[1] as the genotype.

Most of the species have been described under other generic names, the earlier ones under *Ichneumon* and *Pimpla*, the latter name having been most commonly employed.

KEY TO NORTH AMERICA SPECIES.

1. All coxae black, at least basally (in some males only the hind coxae are black, the others yellow).......... 2

Front coxae only black and usually only at base.......... 5

2. Hind and middle tibiae and tarsi not annulated; trochanters black; scutellum strongly margined to apex; front coxae concave behind...*atrocoxalis* (Cresson).

Hind and usually the middle tibiae and tarsi annulated with white; scutellum not strongly margined to apex; front coxae normal..........3.

3. Head behind the eyes broad and strongly rounded; front claws in female without basal tooth; all coxae in male entirely black..........*evetriae* (Viereck).

Head behind the eyes narrowed and only moderately convex; front claws in female with basal tooth; front and middle coxae in male whitish or testaceous at least at apex..........4.

4. Abdomen more or less red laterally and with tergites yellow tipped; front and middle coxae in male black nearly to apex..........*behrensii* (Cresson).

Abdomen entirely black; coxae in female red, in male front and middle coxae mostly pale, hind coxae black..........*obesus* Cushman (male).

5. Mesepisternum with a distinct, sharp, oblique furrow across the upper end of the prepectal suture; venter black..........*temnopleuris*, new species.

Mesepisternum without such a furrow; venter black and white..........6.

6. Apices of tergites distinctly yellowish or whitish; abdomen shining. *conquisitor* (Say).

Apices of tergites at most narrowly piceous; abdomen opaque or subopaque....7.

7. Propodeum polished impunctate throughout, nervulus slightly postfurcal. *quadricingulatus* (Provancher).

Propodeum polished only behind and medially; nervulus practically interstitial..8.

8. Abdomen in female very broad fusiform, third tergite at least twice as wide at apex as long in middle, first tergite with anterior basin occupying about two-thirds of dorsal length; postocellar line and diameter of lateral ocellus equal and twice as long as ocell-ocular line..........9.

Abdomen in female narrower, third tergite usually less than twice as wide at apex as long in middle, first tergite with anterior basin occupying but little more than half of dorsal length; post cellar line twice as long as ocell-ocular line.......10.

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[1] Bull. 83, U. S. Nat. Mus., 1914, p. 79.

9. Face in female slightly longer than broad at clypeus; malar space only about one-third as long as basal width of mandible; temples seen from above very sharply sloping, their cephalo-caudad length barely half that of eye; hind coxae of male black..*obesus* (Cushman).

   Face in female slightly wider than long, malar space nearly half as long as basal width of mandible; temples seen from above less sharply sloping, their cephalo-caudad length about two-thirds that of eye; male unknown..*latus*, new species.

10. Malar space about a third as long as basal width of mandible; tegulae entirely yellow; apical joint of hind tarsus with complete basal white annulus.........11.

   Malar space distinctly more than a third as long as basal width of mandible; tegulae brown at apex; apical joint of hind tarsus with incomplete annulus. *montana*, new species.

11. Tergites entirely black; apex of hind femur blackish; humeral angle of pronotum without a white spot.....................................*leavitti*, new species.

   Tergites narrowly piceous apically; hind femur not black at apex; humeral angle of pronotum with a more or less distinct whitish spot.....*pacificus*, new species.

EPHIALTES (ITOPLECTIS) ATROCOXALIS (Cresson).

Pimpla atrocoxalis Cresson, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 145, female. Type, Acad. Nat. Sci. Phila., No. 1423.

Discussion based on homotype female (Viereck), 12 other females, and 6 males.

This species and the European *ovalis* Thomson differ from all other species of the genus *Ephialtes* by the form of the front coxae, a character common to both sexes. In general appearance it resembles *Ephialtes* more closely than *Itoplectis*, but the short malar space, deeply emarginate eyes, location of antennal foramina, short tarsal spines, and the basally lobate front claws in the female ally it with *Itoplectis*. It is very distinct from all other North American species of the latter subgenus in the unannulated tibiae and tarsi, black trochanters, and strongly margined scutellum.

From *ovalis*, represented in the United States National Museum by a single female, it differs only slightly as follows: Antennae generally darker; temples more strongly rounded; tegulae pale only at extreme base; carinae weaker and slightly more convergent posteriorly.

Malar space distinctly less than half as long as basal width of mandible; clypeus truncate at apex; inner eye margin deeply emarginate; face slightly narrower than vertex; antennae about two-thirds as long as body, rather stout but not attenuate either at base or at apex, the lower margin of their foramina at about middle of eye; front rather deeply concave, strongly punctate; diameter of lateral ocellus greater than length of ocell-ocular line, which is but little more than half as long as postocellar line; temples narrow, nearly flat; notauli very weakly impressed but indicated well back on the mesoscutum; propodeum rather strongly ridged laterally, polished medially and posteriorly, otherwise confluently punctate, spiracle long oval to broad oval depending on size and sex; basal lobe of front claw rather small.

In size this species varies from 8.5 mm. to 15 mm. in females and 5mm. to 14 mm. in males.

Distribution.—Cresson's type came from Hudson Bay Territory. In the National Museum are specimens from Nevada, Utah, California, Colorado, and New Mexico. Its distribution is apparently northern extending south along the high altitudes of mountain ridges.

Hosts.—*Malacosoma fragilis* (New Mexico); *Autographa californica* (Colorado).

EPHIALTES (ITOPLECTIS) EVETRIAE (Viereck).

Itoplectis evetriae VIERECK, Proc. U. S. Nat. Mus., vol. 44, 1913 (April), p. 565, male. Type, Cat. No. 15294, U.S.N.M.

Itoplectis plesia ROHWER, Proc. Ent. Soc. Wash., vol. 15, 1913 (January 22, 1914), p. 182, female. Type, Cat. No. 17063, U.S.N.M.

Discussion based on type and paratypes of *evetriae*, type of *plesia*, and five others of each sex.

Rohwer's species is simply the female of Viereck's reared from a larger host and differing from females reared from the type host, *Evetria taxifoliella*, only in size and the variant characters, such as longer propodeal spiracle, which accompany larger size throughout the genus.

This species differs from all other species of the subgenus, and resembles *Ephialtes* in lacking the lobes on the front claws in the female. In all other respects, however, it agrees with *Itoplectis*. From all other species of *Itoplectis* it differs in the form of the head with its very broad and strongly rounded temples.

Clypeus truncate at apex; malar space less than half as long as basal width of mandible; eyes rather broadly emarginate; face broader than vertex in both sexes; antennae slender, slightly attenuate at base; the lower margins of their foramina slightly above middle of eye; front rather shallowly concave, polished with some punctures medially; notauli obsolete; propodeum very short and declivous but strongly ridged laterally, nearly the whole dorsal surface polished, lateral surface weakly punctate, spiracle round to broadly oval.

All of the specimens are from hosts in two genera, those from the smaller host being about 6 mm. long and those from the larger host about 10 mm. long.

This is a western species, the types of *evetriae* being from California and that of *plesia* from Montana, while other specimens are from Oregon and Montana.

The hosts of this species as shown by the rearings are *Evetria*, sp. (probably *taxifoiella*), in cones of *Pseudotsuga taxifolia* at Yreka, California (types of *evetriae*, Hopkins No. 11415*b*); *Evetria taxifoliella* Busck in cones of *Pseudotsuga taxifolia* (Ashland, Oregon, Hopkins Nos. 10874*bc*, 13209*bb*[1,5,7]; Colestin, Oregon, Hopkins No. 12535*t*; Missoula, Montana, Hopkins No. 10896*d*); *Evetria siskiyouana* Busck in cones of *Pseudotsuga taxifolia* (Ashland, Oregon, Hopkins No. 12510*b*); *Evetria siskiyouana* Busck in cones of *Abies concolor* (Ashland, Oregon, Hopkins No. 12529*e*[2]); *Pinipestis zimmermanni* Grote in twigs of *Pinus ponderosa* at Camas, Montana, Hopkins No. 11528 (type of *plesia*); and *Pinipestis cambiicola* Dyar on same host tree on the Flathead Reservation, Montana, Hopkins No. 12565*a*.

EPHIALTES (ITOPLECTIS) BEHRENSII (Cresson).

Pimpla behrensii CRESSON, Proc. Acad. Nat. Sci. Phila., 1878, p. 377, female, male. Type, Acad. Nat. Sci. Phila., No. 1424, female.

Discussion based on homotype (Viereck), 14 other females, and 8 males.

This species is the American prototype of the genotype, *maculator* (Fabricius), differing from that species principally in having the basal joint of the trochanters red instead of black, the legs somewhat less ornately colored, the antennae darker, the pubescence of the thorax silvery rather than cinereous, and the ovipositor shorter. It is very distinct from all other American species by the color of the abdomen, which is black medially and red laterally, with the tergites narrowly yellowish at apex.

Clypeus broadly rounded at apex; malar space half as long as basal width of mandible; eyes deeply emarginate within; face and vertex equal in width; antennae about two-thirds as long as body, very slightly attenuate at base, the lower margins of their foramina at middle of eye; front shallow, ruguloso-punctate medially; diameter of lateral ocellus much longer than ocell-ocular line; notauli barely impressed; propodeum polished medially and posteriorly, otherwise densely punctate; spiracle nearly round; first tergite with dorsal carinae strong; ovipositor barely a fourth as long as abdomen; all coxae black, reddish at apex; all tibiae with at least a trace of annulation; all joints of hind tarsi except fourth white at base; antennae slightly paler beneath, especially toward apex.

The specimens vary very little in size, females ranging from 9 mm. to 10.5 mm. and males from 7.5 mm. to 9 mm. in length.

The type series and all the National Museum specimens are from California, where many of them were reared from pupae of *Phryganidia californica*, which is apparently the only known host.

EPHIALTES (ITOPLECTIS) QUADRICINGULATUS (Provancher).

Pimpla 4-cingulatus PROVANCHER, Nat. Can., vol. 12, 1881, p. 38, female.

Known to me only from the description and from notes on the type by S. A. Rohwer, this species is apparently closely related to the several species that follow it in the key to species. It agrees with *leavitti* and *pacificus* in having the apical joint of the hind tarsus with a complete basal annulus and the tegulae entirely pale, and with the former in the entirely black abdomen; but, according to notes by Mr. Rohwer, it differs from both in having the propodeum entirely polished impunctate and the nervulus slightly postfurcal. *Leavitti* is from the same region as Provancher's type and will very likely prove to be synonymous.

EPHIALTES (ITOPLECTIS) OBESUS Cushman.

Itoplectis obesus CUSHMAN, Proc. U. S. Nat. Mus., vol. 53, 1917, p. 467, female, male. Type, Cat. No. 20779, U.S.N.M.

Discussion based on type, allotype, paratype, one other female, and two other males, all in the National Museum.

Very closely allied to *Itoplectis alternans* Gravenhorst of Europe, but distinguishable by the darker antennae, wing veins and stigma, the brown tipped tegulae, and the fact that only the first two or three hind tarsal joints are white at base.

This and the following four new species are very closely allied, being separable only by characters which are in themselves more or less variable. With larger series of specimens it is entirely likely that some or all of them will be found to be synonyms. On the characters used, however, they fall into groups of similar geographical range and size and it seems inadvisable to synonymize any of them at present. All except *obesus* are based entirely on the female, it being impossible to associate the males with their proper females. Some of the males have the coxae red, while others have them black.

In the male *obesus* differs from *behrensii* in having the front and middle coxae mostly pale.

Malar space much less than half as long as basal width of mandible; clypeus broadly rounded at apex; eyes deeply emarginate within; antennae distinctly stouter toward apex; front shallow, punctate medially; diameter of lateral ocellus much longer than ocell-ocular line; notauli barely indicated; thorax nearly as high as long; propodeum very short, polished medially and posteriorly, otherwise densely punctate; spiracle round to very broad oval; ovipositor about a third as long as abdomen.

The type, paratype, and one other female are from Wenatchee, Washington, where they were reared from pupae of the fruit-tree leaf-roller (*Archips argyrospila*); the allotype from Clark County, Washington, reared from the bud moth (*Tmetocere ocellana*); another male from Duncan, British Columbia, reared from *Tortrix fumiferana;* and a male from Summit, Placer County, California, collected by W. M. Giffard.

EPHIALTES (ITOPLECTIS) LATUS, new species.

Female.—Length, 10 mm.; antennae, 7 mm.; ovipositor, 2 mm.

Differs from *obesus* Cushman by the characters used in the key and also as follows: Mesoscutum scarcely as wide as long, sparsely finely punctate; propodeum slightly convex in profile; tergites very narrowly pale at apex; antennae brownish below, the sutures black.

Host.—*Chalia fragmentella* Henry Edwards.

Type locality.—Albee, Oregon.

Other localities.—Pullman, Washington, and Beulah, New Mexico.

Type.—Cat. No. 22872, U.S.N.M.

Discussion from three females, the type reared under Hopkins U. S. No 9063*aa* on August 15, 1913, by Carl Heinrich, paratype *a* taken June 7, 1908, at Pullman, Washington, and paratype *b* on August 13 at Beulah, New Mexico, by T. D. A. Cockerell.

EPHIALTES (ITOPLECTIS) LEAVITTI, new species.

Female.—Length, 8 mm.; antennae, 6 mm.; ovipositor, 1.5 mm.

Differs from description of *obesus* as follows: Postocellar line longer than diameter of lateral ocellus, which is much less than twice as long as ocell-ocular line; mesoscutum sparsely, weakly punctured, the pubescence dark and inconspicuous; propodeum convex in profile, dorsal carinae extending about halfway to apex; spiracles rather small, nearly round; abdomen not especially broad, third tergite more than half as long as wide; first tergite with dorsal carinae strong to beyond middle, anterior basin occupying little more than half of dorsal length; tegulae yellow throughout; wings brownish hyaline, stigma brown and only slightly paler at base and apex; humeral angle of pronotum without a pale spot; abdomen black with only first and second tergites obscurely piceous at apex; apical joint of hind tarsus with complete basal annulus.

Type locality.—St. Johns, New Brunswick.

Type.—Cat. No. 22873, U.S.N.M.

Described from two females collected October 3 by A. G. Leavitt, for whom the species is named.

The paratype has the piceous margins of tergites more distinct.

EPHIALTES (ITOPLECTIS) PACIFICUS, new species.

Female.—Length, 7.5 mm.; antennae, 5.5 mm.; ovipositor, 1.4 mm.

Differs from description of *obesus* as follows: face with well separated punctures, and sparsely pubescent; malar space nearly half as long as basal width of mandible; postocellar line longer than diameter of lateral ocellus, which is much less than twice as long as ocell-ocular line; mesoscutum sparsely, weakly punctured; mesopleura and mesosternum very sparsely, weakly punctured; propodeum convex in profile, carinae subparallel and reaching to about middle; spiracles rather small and nearly round; abdomen rather slender, third tergite nearly two-thirds as long as wide; first tergite with dorsal carinae reaching beyond middle, anterior basin occupying little more than half dorsal length; tegulae entirely yellow; color pattern not repeated on front tibiae; antennae brown beneath; wings brownish hyaline, stigma brown with apex and base but slightly paler; apical joint of hind tarsus with complete basal annulus.

Hosts.—*Euceratia castella* Walsingham, *Laspeyresia pomonella* (Linnaeus).

Type locality.—Menlo Park, California.

Other localities.—Vancouver, British Columbia; Alameda County, California.

Type.—Cat. No. 22874, U.S.N.M.

Described from four females, the type collected January, 1905, by F. Hornung; paratype *a* from Vancouver by C. F. Baker; paratype *b* and *c* reared by A. Koebele in Alameda County, California, *b* in June from *Euceratia castella* (Bur. Ent. No. 217°) and *c* in August from *Laspeyresia pomonella* (Bur. Ent. No. 235°).

Paratype *a* is somewhat smaller and *c* considerably larger than the type.

EPHIALTES (ITOPLECTIS) MONTANA, new species.

Female.—Length, 8 mm.; antennae, 6 mm.; ovipositor, 1.5 mm. Differs from description of *obesus* as follows: face with well separated punctures; malar space nearly half as long as basal width of mandible; postocellar line longer than diameter of lateral ocellus, which is less than twice as long as ocell-ocular line; mesoscutum sparsely, weakly punctate, mesopleura and mesosterum even more weakly so; propodeum convex in profile, dorsal carinae strong only at base but extending obsoletely nearly to middle, spiracles rather small, nearly round; abdomen narrow, third tergite nearly two-thirds as long as wide, first tergite with dorsal carinae extending beyond middle, anterior basin but little more than half total length of tergite; all palpi pale; antennae brown; wings brownish stained.

Type locality.—Colorado.

Other localities.—White Mountains, New Mexico; Fort Wrangel, Alaska.

Type.—Cat. No. 22875, U.S.N.M.

Described from six females, the type and paratypes *a*, *b*, and *c* from the C. F. Baker collection from Colorado; paratype *d* collected at 8,500 feet in the White Mountains of New Mexico by C. H. T. Townsend, and paratype *e* collected at Fort Wrangel, Alaska, by H. F. Wickham. Paratype *b* is the largest, being 9.5 mm. in length.

EPHIALTES (ITOPLECTIS) CONQUISITOR (Say).

Plate 21, fig. 1.

Cryptus conquisitor SAY, Bost. Journ. Nat. Hist., vol. 1, pt. 3, 1836, p. 232, female. Type, Lost. Neotype in U. S. National Museum.

Cryptus pleurivinctus SAY, Bost. Journ. Nat. Hist., vol. 1, pt. 3, 1837, p. 235, female, male. Type, Lost. Neotype in U. S. National Museum.

Pimpla conquisitor RILEY, 4th Ann. Rept. Ins. Mo., 1872, p. 72.

Pimpla walshii DALLA TORRE, Cat. Hym., vol. 3, p. 454. (=*pictipes* Walsh, Trans. Acad. Sci. St. Louis, vol. 3, 1873, p. 135, female) not Gravenhorst. Type, Destroyed. Neotype in U. S. National Museum.

Apechtis conquisitor MORLEY, Rev. Ichn., pt. 3, 1914, p. 32.

Scambus (*Itoplectis*) *conquisitor* VIERECK, Hym. Conn., 1917, p. 321.

Discussion based on neotypes determined from each of the three descriptions and a great many other specimens of both sexes. The neotypes are labeled as follows: *conquisitor*, "Collection Belfrage"; *pleurivinctus*, "35^{01} *Pimpla conquisitor* on *Th. ephemeraeformis*, Iss. Sept. 23, '82"; *walshii*, "301, vii. 10, East River, Conn., July, C. R. Ely"; and each is further indicated by a neotype label. They agree in practically every particular with the original descriptions.

All three of the types being lost or destroyed, the only way of determining their nature is from the descriptions. The *conquisitor* type is rather uncommonly small, representing nearly the minimum size for the species while *pleurivinctus* represents nearly the other extreme. The latter, from description and biological notes, is undoubtedly the form of *conquisitor* commonly reared from the larger lepidopterous pupae. The host mentioned by Say is "the common folliculate Linnaean *Bombyx* with transparent wings", undoubtedly *Thyridopteryx ephemeraeformis*, commonly a host of this species. It is quite evident that Walsh's specimen was a small specimen of *conquisitor* with a rather unusual amount of black on the legs and with the apices of the tergites slightly darker than in the more typical specimens. Many specimens of *conquisitor* have a trace of the blackish color on the front and middle tibiae and middle tarsi and the apices of the tergites distinctly reddish rather than white. The neotype of *walshii* differs from the description only in minor details, the black of the legs being less distinct.

Within its range this is probably the most common species of the tribe and one of the most variable. It is always readily distinguishable from any other species by the very definite pale borders of the otherwise black tergites.

The very large series of this species available forms a good basis for a study of the possible range of specific variation in the genus.

Most of the structural variations and to some extent those of color accompany variation in size. The following description is drawn from a female and a male of average size, while the observations on variation are based on the entire series of two hundred or more specimens with special reference to the largest and smallest specimens of each sex available, the character of the smallest being stated first in each case:

Female.—Clypeus very broadly rounded at apex; malar space about one-third as long as basal width of mandible; vertex slightly wider than face; eyes deeply emarginate; antennae about two-thirds as long as body, barely attenuate toward base, lower margins of their foramina distinctly above middle of eye; front shallow, weakly ruguloso-punctate medially; diameter of lateral ocellus distinctly longer than ocell-ocular line, the latter barely more than half as long as post-ocellar line; notauli barely indicated; propodeum polished medially and apically, otherwise punctured, the punctures fading out gradually and becoming obsolete in front of the spiracle, the latter broad oval; first tergite very slightly longer than second; ovipositor little more than one-third as long as abdomen.

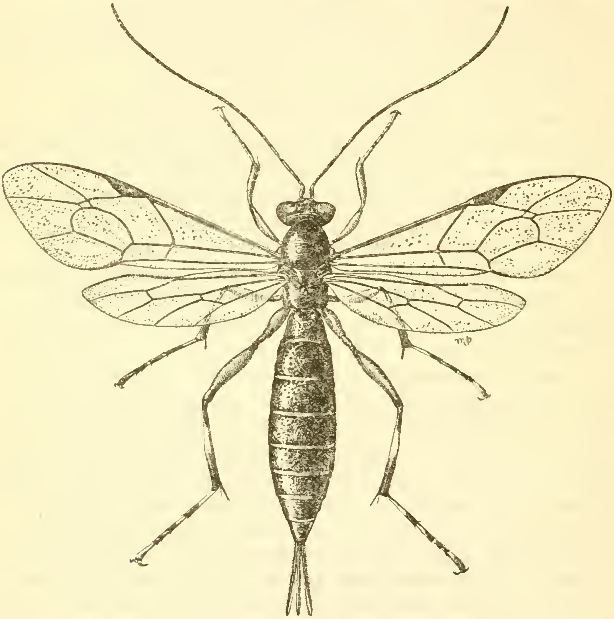

FIG. 1.—EPHIALTES (ITOPLECTIS) CONQUISITOR (SAY).

Male.—Differs from female in above characters as follows: Malar space hardly a third as long as basal width of mandible; antennae somewhat shorter and more strongly attenuate basally, lower margins of foramina at middle of eye; front more shallow and more strongly punctured; temples more strongly rounded, less sharply sloping.

Variation.—Female.—5.5–15 mm. Head from above slightly more to slightly less than half as long as wide, temples from strongly rounded to nearly flat; front barely concave to rather strongly concave, the concavity extending up to the vertex and down at each side below the antennae; face from sparsely punctate and polished to densely rugosely punctate and subopaque; antennal foramina from middle to distinctly above middle of eye; mesoscutum from slightly longer than wide with no indication of notauli to much longer than wide with notauli weakly indicated to near middle; propodeum from strongly rounded to rather flattened above, the spiracle round to broad oval; first tergite from distinctly longer than wide with spiracles prominent to as wide as long with spiracles not prominent; legs pale to bright testaceous; tegulae, humeral spot, wing base, and annuli of hind legs pure white to yellowish white; wings hyaline to yellowish.

Male.—About as given for female except that sculpture of face varies but little. Perhaps the most remarkable variation is in the form of the abdomen in this sex. In the small specimens it is but little more than twice as long as the thorax, elongate fusiform, and densely, rather opaquely punctured, while in the large ones it is fully three times as long as the thorax, linear, sparsely punctate, and highly polished. In the small form the wings reach nearly to the apex of the abdomen and in the large form barely two-thirds of the way.

The above characters vary with considerable constancy with size. Other variations not so closely correlated with size are: Ovipositor much less than one-third to distinctly more than one-third as long as the abdomen; front and middle tibiae entirely without or with considerable black externally; apices of tergites from nearly pure white to pale reddish yellow; hind tarsal joints from mostly white to less than half white; scape beneath in male from entirely white to entirely black.

Distribution.—From the States and Provinces represented in the National Museum collection the range of this species is practically the entire area east of the Rocky Mountains and from Quebec south to Georgia and Texas, and there is also a series of a dozen specimens from Bermuda.

Hosts.—The host range is as wide as the geographic, including both macrolepidoptera and microlepidoptera, with an occasional case of secondary parasitism and of parasitism on an insect of some other order. The following hosts are represented in the United States

National Museum collection: *Malacosoma americana, Hyphantria cunea, Hemerocampa leucostigma,* Tussock moth (Nebraska), *Hemileuca lucina, Alabama argillacea, Autographa brassicae, Bleptina* species, *Anomis erosa, Diaphania hyalinitalis, Diaphania quadristigmalis, Ennomos subsignaria, Thyridopteryx ephemeraeformis, Archips argyrospila, Tortrix quercifoliana, Tortrix fervidana, Tortrix fumiferana,* tortricid on oak, tortricid on cedar, leaf-tier on oak, *Acrobasis rubrifasciella, Acrobasis betulella, Acrobasis kearfottella, Acrobasis caryalbella, Acrobasis caryaevorella, Acrobasis* species, *Eulia pinitubana, Peronea hastiana, Peronea minuta, Peronea* species on hornbeam, *Tmetocera ocellana, Cenopis pettitana, Polychrosis viteana, Evetria frustrana, Epermenia cicutaella, Oxyptilus periscelidactylus,* secondary on lepodopterous larva through *Rogas terminalis,* and the coleopteran *Oncideres cingulata.* The parasitism on *Rogas terminalis* was proved by the writer by the finding in the *Rogas* cocoon of the larval exuvium of the *Itoplectis;* but examination of the pupa of the coleopteran, which was considerably shattered, failed to disclose any trace of the parasite exuvium.

The following additional hosts have been recorded: *Mineola indigenella,*[1] *Cacoecia cerasivorana,*[2] *Cingilia catenaria.*[3] The recording of *Phryganidea californica* in Insect Life (vol. 3, p. 462) is probably due to a mistake in the determination of the parasite; specimens of *Itoplectis behrensii* (Cresson) in the United States National Museum bear the data given in the above record and are undoubtedly the specimens referred to. Fiske reared *conquisitor* as a secondary parasite of *Malcosoma americana* through several species of primary parasites (*Limneria*) *Hyposoter fugitivus* (Say), *Ameloctonus clisiocampae* (Weed), *Rogas intermedius* Cresson, *Spilocryptus extrematis* (Cresson), and *Iseropus coelebs* (Walsh) (listed as *Pimpla inquisitor* Say), being the immediate hosts.

Fiske stated that this species oviposits in the pupa of the host.

EPHIALTES (ITOPLECTIS) TEMNOPLEURIS, new species.

Female.—Length, 14 mm.; antennae (broken); ovipositor, 4 mm.

Very closely allied to *conquisitor* (Say), differing from the largest specimens of that species practically only as follows: mesopleurum with a sharply incised, oblique furrow across the top of the prepectal suture; propodeum more strongly, densely punctate; abdominal venter entirely black; apices of tergites narrowly piceous.

Host.—*Iphiclides ajax.*

Type locality.—United States.

Type.—Cat. No. 20909, U.S.N.M.

Described from two females unlabeled except that the type bears the host label. The paratype is very like the type.

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[1] Ins. Life, vol. 3, p. 462.

[2] Fiske, Tech. Bull. 6, N. H. Expt. Sta., p. 190.

[3] Dimmock, Proc. Ent. Soc. Wash., vol. 4, p. 154.

SPECIES WRONGLY INCLUDED IN ITOPLECTIS.

Itoplectis orgyiae ASHMEAD, Trans. Amer. Ent. Soc., vol. 23, 1896, p. 213, is an *Iseropus.*

Genus APECHTHIS (Foerster) Woldstedt.

Apechthis (Foerster) WOLDSTEDT, Verh. Naturh. Ver. preuss. Rheinl., vol. 25, 1868, p. 164; Bull. Acad. Imp. Sci. St. Petersbourg, vol. 10, 1877, p. 15, separate. Type, *Ichneumon rufatus* Gmelin.

The original description of *Apechthis* consists of the characters employed by Foerster in his generic key to distinguish it from the other genera of the Pimploidae. No species were referred to the genus until Woldstedt (see reference above) included two species, *Pimpla rufata* (Gmelin) and *Pimpla varicornis* Fabricius. The former was designated as the genotype by Viereck.[1]

From *Ephialtes* this genus is easily distinguished by the polished, maculate face; the long second tergite; the downcurved ovipositor; and the possession by all the claws in the femanle, except sometimes those of the hind legs, of the basal lobe or tooth.

The character used by Morley (Rev. Ichn., pt. 3, 1914, p. 4) to separate this genus from *Itoplectis* and *Pimpla* (i. e., the possession by the female of basally lobate claws), will not hold as stated, for most species of *Itoplectis* have the claws of the front tarsi lobate or toothed, and some species of *Apechthis* lack the lobate claws on the hind tarsi. On this character Morley referred *Itoplectis conquisitor* (Say) to *Apechthis.* This species has the front claws lobed, but in this respect it does not differ from *Itoplectis maculator* (Fabricius), the genotype, nor from *alternans* (Gravenhorst) and *ovalis* (Thomson), all three of which Morley placed properly in *Itoplectis.*

Judging from the rather small series of specimens available the species of this genus vary in structure in much the same manner as do those of *Ephialtes.* This variation is especially conspicuous in the degree of convexity and convergence of the temples, comparative length and breadth of the mesoscutum, the position and strength of the propodeal carinae, and the sculpture of the tergites. Variation in color is even more marked than in *Ephialtes* on account of the cephalic and thoracic maculation, especially of the males. In some of the North American species the color of the hind legs varies from black and white to brownish and yellowish; in the tarsi of some specimens the light color predominates, the dark being confined to a narrow apical annulus on each joint; while in others the dark color occupies all but the basal and ventral portion of the first joint. The tegulae may vary within a species from white to nearly black. The face in the male varies from entirely yellow to more or less brown or black marked. The mesoscutal markings vary from entirely absent to broad and conspicuous.

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[1] Bull. 83, U. S. Nat. Mus., 1914, p. 13.

KEY TO NORTH AMERICAN SPECIES.

1. First tergite prominently elevated in middle; hind tarsal claws in female with basal tooth........2.
   First tergite not prominently elevated in middle; hind tarsal claws in female without basal tooth........*ontario* (Cresson).
2. Front coxae in female black basally, whitish at apex, in male reddish; face in male entirely yellow........3.
   Front coxae tricolored (black, white, and red); face in male more or less black........*pacificus*, new species.
3. Mesoscutum without lateral yellow markings........*picticornis* (Cresson).
   Mesoscutum with yellow markings laterally before tegulae... *componotus* (Davis).

APECHTHIS PICTICORNIS (Cresson).

Plate 21, fig. 2.

Pimpla picticornis Cresson, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 146, male. Type, Acad. Nat. Sci. Phila., No. 1416.

Pimpla annulicornis Cresson, Trans. Amer, Ent. Soc., vol. 3, 1870, p. 147, female, male. Type, Acad. Nat. Sci. Phila., No. 1638.

Scambus (*Pimplidea*?) *annulicornis* Viereck, Hym. Conn., 1917, p. 321.

Scambus (*Tromatobia*?) *picticornis* Viereck, Hym. Conn., 1917, p. 322.

Synonymy and discussion based on examination of types, other specimens in the Academy of Natural Science of Philadelphia, and seven females and two males in United States National Museum.

The types of the two descriptions are merely color variations.

In addition to the characters given in the key to species differs from *ontario* (Cresson) as follows: Antennae yellow beneath; front coxae mostly black, whitish at apex, sometimes all yellow in male; propodeum with upper hind angles prominent, the lateral face of the propodeum having its upper margin parallel to the pleural carina; punctuation of tergites very dense and sometimes confluent; averages somewhat larger.

Length.—Female, 11–15 mm.; male, 8–13 mm.

Distribution.—The type of *picticornis* is from New Jersey, that of *annulicornis* from Illinois and the allotype female from Pennsylvania. The series in the National Museum contains specimens from New Brunswick, Ontario, Michigan, Pennsylvania, New Jersey, and Texas.

Nothing is known of the hosts of this species.

APECHTHIS COMPONOTUS (Davis).

Pimpla componotus Davis, Trans. Amer. Ent. Soc., vol. 24, 1898, p. 367, male. Type, Acad. Nat. Sci. Phila.

The type and only known specimen of this species is very highly ornamented. Structurally it is very much like *picticornis*, and it is possibly an extreme variant of that species. One of the National Museum specimens of *picticornis* has the positions of the notauli marked with yellow but lacks the lateral markings of mesoscutum and those of mesopleura and mesosterum. The type of *componotus* is also from a locality far west of the most western known range of *picticornis*, being from Idaho.

APECHTHIS PACIFICUS, new species.

Easily distinguished in both sexes from any of the above-mentioned species by its tricolored front coxae, by the fact that the middle, as well as the hind tibiae are black with a white annulus, and from all but *componotus* by the yellow margined mesoscutum. The female differs from *ontario* in having a small tooth at the base of the hind claw and from *annulicornis* in this tooth being much smaller than in that species. The male differs from all described North American males in not having the face entirely yellow.

Female.—Length, 12 mm.; antennae, 10 mm.; ovipositor, 2 mm.

Head shining; face sparsely, weakly punctate; temples weakly, evenly convex, very sharply sloping; malar space a third as long as basal width of mandible. Thorax shining, dorsal angle of pronotum, mesoscutum, scutellum, mesopleura (except posteriorly), mesosternum, and metapleura sparsely, weakly punctate; propodeum laterally and at sides dorsally distinctly, rather densely punctate, medially and posteriorly polished; notauli rather sharply but very briefly impressed; propodeum in profile strongly rounded dorsally, rather precipitate posteriorly, not at all angulate at the sides, and with the upper hind angles barely indicated, carinae weakly divergent, strong dorsally but not extending onto the posterior face; basal teeth of all tarsal claws small, those of hind tarsi extremely so. Abdomen very densely, finely punctate, the punctures longitudinally elongate, tubercles strong, transverse; first tergite strongly angulate above, laterally rugosely coriaceous; second tergite nearly as long medially as wide at apex.

Black; mandibles, first two joints of maxillary palpi; inner orbits, a semicircular spot at top of eye, tegulae, humeral angle of pronotum, sides of mesoscutum from tegulae to notauli, a small spot at each side of middle of mesoscutum just in front of scutellum, and apices of scutellum and postscutellum white or whitish; apical three joints of maxillary palpi and entire labial palpi fuscous; antennae black, brownish beneath; pedicel and basal joint of flagellum white marked beneath; front coxae black with a white spot in front and a red stripe outwardly; other coxae and middle and hind trochanters and femora testaceous; the hind femora apically infuscate; front femora and trochanters pale testaceous, whitish in front; hind tibia and tarsus black, the tibia with a broad white annulus, and the tarsal joints all more or less white basally; this pattern repeated, but less contrastingly, on the middle and front legs, the dark color not extending entirely around the tibiae and the tarsi being white with the joints apically reddish; wings hyaline, veins and stigma, except metacarpus, costa, and base of stigma, black. Abdomen black with the apical margins of all segments very narrowly castaneous; sternites and pleurites black separated by broad bands of white.

Male.—Length, 9 mm.; antennae, 8 mm. Unusually similar to the female, differing practically only in the color of the middle tarsi, palpi, antennae, and face and in the lack of the two white marks on the posterior edge of mesoscutum; palpi except apical joint of labial palpi, which is fuscous, white; clypeus and face white, with clypeal suture, median stripe on face, and a triangular mark below each antenna black; antennae black, with scape as well as pedicel and basal joint of flagellum white beneath; middle tarsi fuscous instead of reddish as in female.

Host.—Notolophus antiqua (Linnaeus).

Type locality.—Portland, Oregon.

Type.—Cat. No. 22876, U.S.N.M.

Described from three females and four males reared by E. J. Newcomer, of the Bureau of Entomology, under Quaintance No. 14083.

The two female paratypes differ from the type practically only in size, peratype *b* being only 8 mm. long. The three male paratypes differ but little from the allotype, paratype *d* being 10 mm. long and *e* lacking the white markings on scape and lateral margins of mesoscutum.

APECHTHIS ONTARIO (Cresson).

Pimpla ontario CRESSON, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 146, male. Type, Acad. Nat. Sci. Phila., No. 1415.

Discussion based on type, specimens compared with type by Viereck and the writer, other specimens in the Academy of Natural Sciences of Philadelphia and ten other specimens in the National Museum.

Easily distinguished from *picticornis* (Cresson) by the characters used in the key, and also differing as follows: Antennae pale brownish beneath; front coxae in female mostly reddish, not whitish at apex, mostly whitish in male; propodeum with upper hind angles not especially prominent, the lateral face of propodeum with upper margin and pleural carina converging posteriorly; punctures of tergites well separated, never confluent; averages somewhat smaller.

Length.—Female, 7–12 mm., male 8–10 mm.

Distribution.—The type is from Canada. The National Museum series includes specimens from Quebec, Ontario, Michigan, Vancouver, Washington, Idaho, and California.

Hosts.—A pair from Quebec were reared from the pupa of the spruce bud worm (*Tortrix fumiferana*), a female reared under Hopkins No. 11100 at Pittsburg, New Hampshire, from the same host, and a female from Sonoma County, California, was taken "In the act of ovipositing on *Tortrix* on wild pea."

SPECIES WRONGLY REFERRED TO APECHTHIS.

Apechthis rugulosa Morley, Rev. Ichn., vol. 3, 1914, p. 34.

This species, described from a female from Inverness, British Colombia, is apparently not an *Apechthis*. The uneven tergites, low position of fracture of nervellus, and structure of propodeum would seem to indicate *Tromatobia*.

HOST LIST.

In this list the subgeneric names *Ephialtes* and *Itoplectis* are treated as generic.

Coleoptera.

ONCIDERES CINGULATA.

Itoplectis conquisitor (Say).

SAPERDA CONCOLOR, galls of.

Ephialtes pedalis (Cresson).

Hymenoptera.

AMELOCTONUS CLISIOCAMPAE.

Itoplectis conquisitor (Say).

HYPOSOTER FUGITIVUS.

Itoplectis conquisitor (Say).

ISEROPUS COELEBS.

Itoplectis conquisitor (Say).

ROGAS TERMINALIS.

Itoplectis conquisitor (Say).

SPILOCRYPTUS EXTREMATIS.

Itoplectis conquisitor (Say).

Lepidoptera.

ACLERIS OXYCOCCANA.

Ephialtes aequalis (Provancher).

ACROBASIS BETULELLA.

Itoplectis conquisitor (Say).

ACROBASIS CARYAEVORELLA

Itoplectis conquisitor (Say).

ACROBASIS CARYALBELLA.

Itoplectis conquisitor (Say).

ACROBASIS KEARFOTTELLA.

Itoplectis conquisitor (Say).

ACROBASIS RUBRIFASCIELLA.

Itoplectis conquisitor (Say).

ACROBASIS, species.

Itoplectis conquisitor (Say).

ALABAMA ARGILLACEA.

Ephialtes aequalis (Provancher).
Itoplectis conquisitor (Say).

ANOMIS EROSA.

Itoplectis conquisitor (Say).

ARCHIPS ARGYROSPILA.

Itoplectis conquisitor (Say).
Itoplectis obesus Cushman.

AUTOGRAPHA BRASSICAE.

Itoplectis conquisitor (Say).

AUTOGRAPHA CALIFORNICA.

Itoplectis atrocoxalis (Cresson).

BLEPTINA, species.

Itoplectis conquisitor (Say).

CACOECIA CERASIVORANA.

Itoplectis conquisitor (Say).

CENOPIS PETTITANA.

Itoplectis conquisitor (Say).

CHALIA FRAGMENTELLA.

Itoplectis latus Cushman.

CHLORIPPE CLYTON.

Ephialtes aequalis (Provancher).

CINGILIA CATENARIA.

Itoplectis conquisitor (Say).

CRAMBUS EXSICCATUS.

Ephialtes aequalis (Provancher).

DATANA MINISTRA.

Ephialtes aequalis (Provancher).

DIAPHANIA HYALINITALIS.

Itoplectis conquisitor (Say).

DIAPHANIA QUADRISTIGMALIS.

Itoplectis conquisitor (Say).

ELLOPIA SOMNIARIA.

Ephialtes ellopiae (Harrington).

ENNOMOS SUBSIGNARIA.

Itoplectis conquisitor (Say).

EPERMENIA CICUTAELLA.

Itoplectis conquisitor (Say).

EUCERATIA CASTELLA.

Itoplectis pacificus Cushman.
Itoplectis quadricingulatus (Provancher).

EULIA PINITUBANA.

Itoplectis conquisitor (Say).

EUZOPHERA SEMIFUNERALIS.

Ephialtes aequalis (Provancher).

EVETRIA FRUSTRANA.

Itoplectis conquisitor (Say).

EVETRIA SISKIYOUANA

Itoplectis evetriae Viereck.

EVETRIA TAXIFOLIELLA

Itoplectis evetriae Viereck.

GNORIMOSCHEMA GALLAEASTERELLA.

Ephialtes aequalis (Provancher).

HEMEROCAMPA LEUCOSTIGMA.

Itoplectis conquisitor (Say).

HEMILEUCA LUCINA.

Itoplectis conquisitor (Say).

HEMILEUCA MAIA.

Ephialtes sanguineipes (Cresson).

HETEROCAMPA GUTTIVITTA.

Ephialtes pedalis (Cresson).

HETEROCAMPA MARTHESIA.

Ephialtes aequalis (Provancher).

HYPHANTRIA CUNEA.

Itoplectis conquisitor (Say).

IPHICLIDES AJAX.

Ephialtes aequalis (Provancher).
Itoplectis temnoplewis Cushman.

LASPEYRESIA POMONELLA.

Ephialtes aequalis (Provancher).
Ephialtes sanguineipes (Cresson).
Itoplectis pacificus Cushman.

LEAF-TIER ON OAK.

Itoplectis conquisitor (Say).

LEUCANIA UNIPUNCTA.

Ephialtes pedalis (Cresson).

MALACOSOMA AMERICANA.

Itoplectis conquisitor (Say).

MALACOSOMA DISSTRIA.

Ephialtes pedalis (Cresson).

MALACOSOMA FRAGILIS.

Ephialtes sanguineipes (Cresson).
Itoplectis atrocoxalis (Cresson).

MINEOLA INDIGENELLA.

Ephialtes aequalis (Provancher).
Itoplectis conquisitor (Say).

MINEOLA JUGLANDIS.

Ephialtes aequalis (Provancher).

NOTOLOPHUS ANTIQUA.

Apechthis pacificus Cushman.

NOTOLOPHUS OSLARI.

Ephialtes sanguineipes (Cresson).

OLENE PINICOLA.

Ephialtes pedalis (Cresson).

ORGYIA BADIA.

Ephialtes pedalis (Cresson).

OXYPTILUS PERISCELIDACTYLUS.

Itoplectis conquisitor (Say).

PERONEA HASTIANA.

Itoplectis conquisitor (Say).

PERONEA MINUTA.

Itoplectis conquisitor (Say).

PERONEA, species on hornbeam.

Itoplectis conquisitor (Say).

PHRYGANIDEA CALIFORNICA.

Itoplectis behrensii (Cresson).

PINIPESTIS CAMBIICOLA.

Itoplectis evetriae Viereck.

PINIPESTIS ZIMMERMANNI.

Itoplectis evetriae Viereck.

POLYCHROSIS VITEANA.

Itoplectis conquisitor (Say).

PORTHETRIA DISPAR.

Ephialtes pedalis (Cresson).
Ephialtes tenuicornis (Cresson).

PROTEROPTERYX BOLLIANA.

Ephialtes aequalis (Provancher).

PYRRHARCTIA ISABELLA.

Ephialtes pedalis (Cresson).

RECURVARIA NANELLA.

Ephialtes aequalis (Provancher).

SABULODES ANFRACTATA.

Ephialtes sanguineipes (Cresson).

SESIA CAUDATA

Ephialtes tenuicornis (Cresson).

SPILOSOMA VIRGINICA.

Ephialtes sanguineipes (Cresson).

SYNANTHEDON PICTIPES.

Ephialtes aequalis (Provancher).

THYRIDOPTERYX EPHEMERAEFORMIS.

Itoplectis conquisitor (Say).

TMETOCERA OCELLANA.

Itoplectis conquisitor (Say).
Itoplectis obesus Cushman.

TORTRICID on CEDAR.

Itoplectis conquisitor (Say).

TORTRICID on OAK.

Itoplectis conquisitor (Say).

TORTRIX FERVIDANA.

Itoplectis conquisitor (Say).

TORTRIX FUMIFERANA.

Apechthis ontario (Cresson).
Ephialtes pedalis (Cresson).
Itoplectis conquisitor (Say).
Itoplectis obesus Cushman.

TORTRIX QUERCIFOLIANA.

Ephialtes aequalis (Provancher).
Itoplectis conquisitor (Say).

TORTRIX, species on wild pea.

Apechthis ontario (Cresson).

TUSSOCK MOTH (Nebraska)

Itoplectis conquisitor (Say).

INDEX.

This index includes all of the species referred to in this paper. Accepted genera and subgenera are in the bold-face type; accepted species in Roman; synonyns in italics; and species erroneously included in a genus in parentheses.

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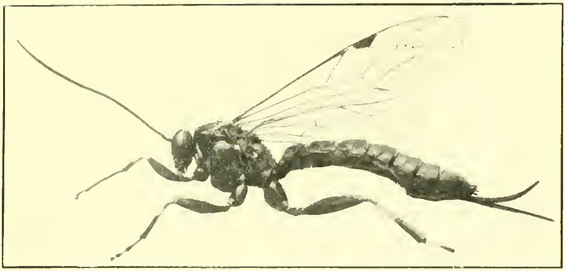
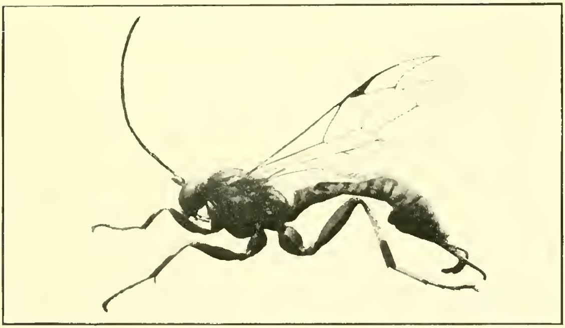
EXPLANATION OF PLATE 21.

FIG. 1.—*Ephialtes* (*Itoplectis*) *conquisitor* (Say),
2.—*Apechthis picticornis* (Cresson).



1. EPHIALTES (ITOPLECTIS) CONQUISITOR (SAY).



2. APECHTHIS PICTICORNIS (CRESSON).

FOR EXPLANATION OF PLATE SEE PAGE 362

NOTES ON THE METEORITE OF ESTHERVILLE, IOWA, WITH ESPECIAL REFERENCE TO ITS INCLUDED "PECKHAMITE" AND PROBABLE METAMORPHIC NATURE.

By George P. Merrill,
Head Curator of Geology, United States National Museum.

This meteorite, both on account of its unusual lithological nature and the number of individuals composing the fall, has been the subject of numerous papers and much study.

It will be recalled that the first description was by Prof. S. F. Peckham,[1] who briefly noted that the stony portion consisted of dark green crystalline masses some of which "are two inches in thickness and exhibit a distinct monoclinic cleavage." This mineral he did not further identify, but stated that thin sections of the stone under the micrsocope showed the presence of olivine and a triclinic feldspar embedded in a matrix of pyroxene. Shepard[2] noted the occurrence of chrysolite in large masses, some showing imperfect crystalline facets and an eminent cleavage. He also noted a "feldspathic mineral, presumably anorthite" and an "opal-like mineral of a yellowish brown color, probably chassignite." No mention was made of any pyroxenic constituent. Smith's investigations[3] were much more elaborate. He determined the presence of bronzite and olivine, the latter in masses "of from one-half to one inch in size, having an easy cleavage, especially in one direction." He also examined the opalescent silicate mentioned by Shepard, and by analysis found its composition as in column I on the next page, which is, he said, "equivalent to $Si\dot{R}_2+\ddot{S}_2i\dot{R}$, or one atom of bronzite plus one atom of olivine, a form of silica that we might expect to find in meteorites." In a second paper he announced a further investigation of the opalescent silicate, which he described as having a dingy yellow color and a fused surface. When broken it showed a greasy aspect, with a more or less perfect cleavage and a structure differing widely from olivine. A second analysis yielded as in column II.

---

[1] Amer. Journ. Sci., vol. 18, July, 1879, pp. 77–78.

[2] Idem, vol. 18, Sept. 1879, pp. 186–188.

[3] Idem, vol. 19, 1880, pp. 459–463, and 495; vol. 20, 1880, pp. 136–137.

	I Per cent.	II Per cent.
Silica (SiO_2)	49.50	49.59
Ferrous oxide (FeO)	15.88	17.01
Magnesia (MgO)	33.01	32.51
	98.39	99.11

These closely agreeing results he felt justified him in considering the mineral a new species, to which he gave the name *Peckhamite*. S. Meunier[1] also studied the meteorite, recognizing the presence of olivine, bronzite, and a triclinic feldspar, and suggested that Smith's peckhamite was not a new mineral species, but a result of "the union of alternate laminae of extremely thin bronzite and olivine." Tschermak,[2] who studied the stone in thin section, recognized the occurrence of olivine, bronzite, and plagioclase. The bronzite he described as having in part the usual appearance, with few inclusions, and in part as clouded by fine dust and showing large glass inclusions. These turbid grains he assumed were of the same nature as Smith's peckhamite, which he described as showing the prismatic cleavage of bronzite, but giving also cleavages which could be referred to the crystal faces of olivine. The optical characters were described as almost similar to those of bronzite. "The whole section," he wrote, "is clouded by a fine dust and also contains larger inclusions of two kinds. One variety is in the form of dark brown to black spheres, the other rod-like or spindle-like colored glass inclusions which correspond to negative crystals and similarly colored round glass inclusions. A glance suffices to show that the substance is a mixture, and the analysis does not give me a result which corresponds to a single mineral." He concluded as a result of his studies that the so-called peckhamite was a bronzite rendered turbid and of a glassy luster by a great quantity of inclusions. In this he was apparently correct. Wadsworth, who was the last to publish the results of a microscopic examination, reported the presence of diallage in addition to the other minerals mentioned, and agreed with Tschermak as to the nature of the peckhamite.

My own investigations were instigated by an examination of a fragment of the stone in the Shepard collection, around one portion of which had been painted a yellow ring, indicative of some unusual feature to which evidently it was wished to call attention. Examination showed this ring to include a yellow-brown, opalescent mineral which it was at once apparent was the original mineral called *chassignite* by Shepard, and *peckhamite* by J. L. Smith. The unusual appearance of this mineral was sufficient to warrant further investigations, the results of which are given below.

The pyroxenic constituents of the stone are of more than ordinary interest and were the first to receive attention. Examination with a pocket lens, or even in many cases with the unaided eye, shows the mineral in two distinct phases—1, a green, highly lustrous form in crystals up to 50 mm. in length, with very evident cleavage, sometimes showing a greasy or opalescent luster; 2, the yellow-brown or opalescent phase without crystal form but very evident cleavage, forming the peckhamite of Smith. This last occurs sometimes in globular and pebblelike forms which show up on a broken surface in a manner suggestive of the perlitic structure of some rhyolitic glasses and again in partially filled cavities, sometimes forming a coating on the interior wall not more than a millimeter or so in thickness, presenting on the inner surface a botryoidal structure such as is common to minerals deposited from solution, as silica, or limonite in geodic form. The two phases, though often in close juxtaposition, are so widely variant that separations and analyses of each were undertaken, with the results given below.

---

[1] Compt. Rend., vol. 94, 1882, pp. 1659-1661.

[2] Photographien, pp. 22 and 23.

	1	2	3		4	5
	Peckhamite.	Enstatite.	Peckhamite.		Enstatite.	Peckhamite.
Silica (SiO_2)	53.04	54.24	49.545	....	54.12	54.54
Alumina (Al_2O_3)	2.80	3.07	....	....	.03	.53
Ferrous oxide (FeO)	14.88	13.98	16.445	....	21.05	12.73
Ferric oxide (Fe_2O_3)	.66	....	....	Cr_2O_3	Trace.	....
Titanic oxide (TiO_2)	.12	.16	....	Alks.	.09	....
Magnesia (MgO)	28.58	28.42	32.76	....	24.50	31.19
Lime (CaO)	None.	None.	....	....	....	0.87
Manganese (MnO)	....	.14	....	....	....	Trace.
	100.08	100.01	98.750	....	99.79	99.86

Not being satisfied to let pass the apparent lack of agreement in the peckhamite analyses by Whitefield (column 1) and Smith (column 3), a second sample was taken from a pebble-form inclosure some 2 centimeters in diameter in the large mass of this meteorite in the Yale University collections. This yielded Mr. E. V. Shannon, of the Department of Geology in the United States National Museum, the results in column 5. It will be noted that this last differs from Whitfield's analysis in showing an increase of 1.50 per cent silica (SiO_2) and 2.61 per cent magnesia (MgO) and a decrease of 2.15 per cent ferrous oxide (FeO). Also in carrying a small amount of lime. Inasmuch as I have no reason to doubt the accuracy of either of these analyses, I am led to the conclusion that the mineral, itself an alteration product, is somewhat variable. I confess, however, to having difficulty in accepting Smith's results (column 3) on the same terms. It is to be noted incidentally that both Whitfield's and Shannon's agree fairly well with those of the enstatites of the Lodhran and Ibbenbuhren meteorites as given by other workers. The two analyses of enstatite as given by Whitfield and Smith agree much more closely than do those of peckhamite, the chief difference being in the proportional amounts of iron and magnesia.[1]

It should be mentioned in this connection that the material in analyses 1, 2, and 5 was carefully assorted and examined under the microscope to assure its purity. The enstatite phase (column 2) was of a bright greenish color, limpid, and almost free from inclosures of any kind. (See fig. 1, pl. 22.) The peckhamite phase (columns 1 and 5) of a yellow-brown hue was so clouded by innumerable empty cavities and inclosures as to be only translucent. (See fig. 2, pl. 22.)

Our results thus far then agree with Tschermak. I may add here, however, that I can not understand the statement of Smith and others relative to a mineral of an olive-green color occurring in masses of from one-half to 1 inch in diameter, having an easy cleavage, especially in one direction, which is identified as *olivine*. I have made repeated examinations of the mineral corresponding to this description and found it in every case to be mainly enstatite, though often intergrown with small amounts of olivine. Analysis 2 on page 365 is of material from one of these crystals carefully freed from possible admixtures with olivine by hand picking and boiling hydrochloric acid and sodium carbonate solutions.

Equally or more difficult of comprehension is his statement that the soluble portion of the stone is "without a trace of lime, thus indicating the absence of anorthite." I find this mineral more or less abundant in every slide examined, and the solution obtained by even a short digestion of the powdered stone in dilute hydrochloric acid yields an abundant precipitate of this constituent. It is, of course, possible that working with a very small amount of material (a fault altogether too common) he may have had a feldspar free sample, but an inspection of the figures on plate 23 must convince one of the insufficiency of such an explanation.

None of the writers quoted note the presence of a calcium phosphate, though the stony portion, when powdered and treated with acid ammonium molybdate, yields abundantly the customary yellow precipitate. I have not been able to determine the mineral by its optical properties alone, but when an uncovered slide is treated with a drop of the molybdate solution sundry areas occupied by an irregular and optically indistinct colorless mineral gradually dissolve out, leaving minute cavities and yielding abundant globules of ammonium phosphomolybdate. The presence of a monoclinic pyroxene, the diallage of Wadsworth, is abundantly confirmed.

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[1] It may be remarked that as Smith's analysis was that of the "insoluble" silicate portion and apparently not examined microscopically it might naturally be expected to contain an admixture of diallage and other impurities. That it does not is but one of the several puzzling things in his work.

The above-described features, with sundry others to be noted, are suggestive of conditions through which the meteorite has passed, which have not received recognition by previous writers and which will, therefore, be considered in some detail here.

One of the most striking features of the stone on casual inspection is its slag-like appearance, even in the interior portions. This was noted by Von Rath,[1] who describes it as highly remarkable on account of the numerous cavities, upon the walls of which small individual (and obviously secondary) crystals have formed. Smith also in his description wrote:[2]

> Another striking feature in the relation of the iron and stony matter is that the larger nodules of iron seem to have shrunk away from the matrix, an elongated fissure of from 1 to 3 mm. sometimes intervening, separating the matrix and nodules to the extent of one-half the circumference of the latter and appearing as if the iron had contracted from the stony matrix during the process of cooling. There are numerous small cavities of various sizes where there are no iron nodules, and where the minerals appear more crystalline, indicating an irregular shrinkage during the consolidation.

No other explanation is, however, attempted.

An examination of the stone in thin sections brings out at once the fact that though the ground is holocrystalline few of the larger constituents present outlines to suggest that they result from crystallizing freely from a molten magma. (See figs. 3, 4, and 5, pl. 22.) Both the pyroxenes—enstatite and "peckhamite" occur in angular or rounded pebble forms, as does also the diallage, and as shown in plate 23. It is obvious, too, I think, that quite aside from this, two minerals similar in composition but dissimilar in color and physical characteristics, as are the first mentioned, could not both have originated from the cooling of the same magma and in the positions they now occupy (figs 3 and 4, pl. 22). It is to be noted further that the larger masses of olivine, or pyroxene, whichever they may be, have a distinct fragmental or pebble-like aspect.[3] (See Nos. 1, 2, and 3 on pl. 24.) That of the "peckhamite" in the Yale specimen and in the slice belonging to the University of Minnesota is also unmistakable.[4] These forms often show on a polished surface numerous fine points of metal which are lacking in the granular ground in which they are imbedded and which serve to still further differentiate them.

The form and crystallographic condition of the feldspathic constituents are often peculiar. Two distinct forms are recognizable in the rock, the one occurring in fairly large plates for the most part clear of inclosures, limpid and with extremely irregular outlines

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[1] Verhandl. Natur. Hist., Vereine, Bonn., vol. 37, 1880, p. 239.

[2] Amer. Journ. Sci., vol. 19, 1880, pp. 559-463.

[3] One of these pebble forms in the Yale University specimen is 8 cm. in greatest diameter.

[4] Smith notes in his description of the mineral that "small rounded nodules, several millimeters in size, are found in the interior of the mass, sometimes of irregular form," etc.

(pl. 23). These often show the broad twin laminae characteristic of anorthite—with which species they seem to agree optically—and are readily soluble in hydrochloric acid. This at times is strongly suggestive of the well-known maskelynite type, into which it, indeed, seems to grade and of which I am at times inclined to regard it as an unusual phase. The second occurs in the usual lath-shaped forms characteristic of basic eruptives, and is unquestionably the result of crystallization in place if not a direct secretion from a molten magma. It is to the larger forms that attention needs particularly to be called. Their most striking features are the irregular outlines referred to above. These, as will be noted by reference to the figures, extend outward into all the minute interstices of the other silicates, often in such minute ramifications as to show that they were the last constituent to solidify from a very liquid magma.

In numerous instances the interior of a crystal is clouded by inclosures and bubbles. Figure 3 shows a marked example of this. In such cases extinction is simultaneous and uniform for the most part over border and nucleal portion alike. In Figure 3, on Plate 23, especially referred to, the colorless border, it will be noted, includes small crystals of pyroxene and perhaps olivine, their small size preventing an exact determination, as their optical properties are obscured by their host. The first thought that arises on seeing these peculiar forms is that of secondary enlargement. But for the fact that the olivine and pyroxene both fuse at a somewhat lower temperature than the feldspars, one might consider these borders as products of a metamorphism due to a rise in temperature, a view sometimes held regarding the maskelynite in chondritic stones. Attention should also be called to the elongated bubbles or cavities extending from nucleal portions out into the clear border in the upper left as the figure is oriented in the plate. In a few instances inclosures in the border were noted, which it was thought from their lack of color, form and occasionally characteristic fracture may be apatite. Here again optical properties are obscured by the host.

The facts presented above, together with the general linear arrangement of the cavities and their secondary minerals, and the peculiar slag-like condition of the mass as a whole, lead me to consider the Estherville meteorite as a product of metamorphism—a stone originally consisting of fragments of the various silicates noted which has been subjected to such compression, heating, and reducing vapors as to render the more finely disintegrated material holocrystalline. Incidentally it has become impregnated with metal resulting from the reduction of some preexisting ferrous mineral. That this may have been a chloride (lawrencite) is possible, but if so the mass has suffered shrinkage, since this mineral would yield, theoretically, but 44.1 per cent of metal. The peculiar sponge-like character of the latter suggests, however, that it was in a sufficiently liquid form to permeate the siliceous matrix in all directions, and hence the existing cavities may convey little idea of the original amount of shrinkage. However this may be, the facts given, as a whole, seems to show that the Estherville meteorite is a metamorphic rock.[1]

My purpose in giving this detailed description of this more than ordinarily interesting meteorite is not merely to show the chemical and petrographic nature of the stone as it is to-day. I have felt for some years that in the discussions of the origin of meteorites too little attention has been given to their composition as compared with terrestrial rocks, and to their "life histories," if I may be allowed the expression, as revealed by a detailed study of their primary structural features and those which have been induced by secondary causes.[2]

If it can be shown that certain conditions must have prevailed to produce existing results, while this may not point to a definite source of origin for the body, it will at least narrow the field of speculation and can in the future lead to more definite conclusions than have many of the theories and guesses proposed in the past.

For the privilege of examining and, in some cases, obtaining material for analysis, the author is indebted to Prof. J. E. Wolff, of Harvard University; Prof. Edward Wigglesworth, of the Boston Society of Natural History; Prof. E. S. Dana, of Yale University; Dr. E. O. Hovey, of the American Museum, New York; and Prof. W. H. Emmons, of the University of Minnesota.

EXPLANATION OF PLATES.

PLATE 22.

ESTHERVILLE, IOWA, METEORITE.

FIG. 1. Cleavage fragments of enstatite showing character of material analyzed.

2. Cleavage fragments of peckhamite showing character of material analyzed.

3. Section showing angular character of "peckhamite" and illustrating fragmental character of stone.

4. Section showing angular character of pyroxene. This figure from the same slide as 2.

5. Section showing angular character and frayed borders of the larger pyroxenes.

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[1] It is interesting to compare this view with that expressed by others. Doctor Wadsworth (Lithological Studies, pp. 92-101) says: "I can find no evidence in the sections that its materials ever held any other relation than the present one and no sign of a former fragmental state, etc." Meunier (Memoirs, Nat. Acad. Sciences, vol. 13, p. 181), wrote: "We may suppose that the original mass was in a fragmentary state, partly stony, partly metallic, perhaps accumulated in a crevice, and was there subjected to metalliferous emanations whose product, in the form of a fine network, cemented these independent elements. The remarkable cavities sometimes occurring between the grains of iron and their stony matrices have been artificially reproduced in experiments on the metallic cementation of the powder of peridot by a process previously described." I do not infer from this that Meunier considered the rock *clastic in the sense that I am now claiming.*

[2] See Merrill, Geo. P. The Composition and Structure of Meteorites Compared with that of Terrestrial Rocks. Smithsonian Report for 1917, pp. 175-188, with 9 plates.

PLATE 23.

ESTHERVILLE, IOWA, METEORITE.

FIG. 1. Micro-section showing general structure. The colorless areas with very irregular borders and no cleavage are anorthite. The black are metal and metallic sulphide; others olivines and pyroxenes.

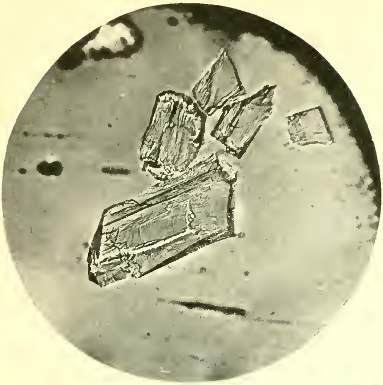
2. The same under somewhat higher magnification and showing feldspars with clouded interiors and clear borders.

3. The same showing a single feldspar in matrix of pyroxenes. Note the rounded form of nucleal portion of the feldspar and the bubbles projecting from this portion into the clear border. The crystal extinguishes as a unit with the exception of a portion of the margin, at the lower right.

PLATE 24.

ESTHERVILLE, IOWA, METEORITE.

Polished slice in cabinet of University of Minnesota. Approximate dimensions 20 by 33 cm. 1 and 2, pebble-form masses of enstatite; 3, pebble-form mass of 'peckhamite"; 4, metal; 5, cavities.



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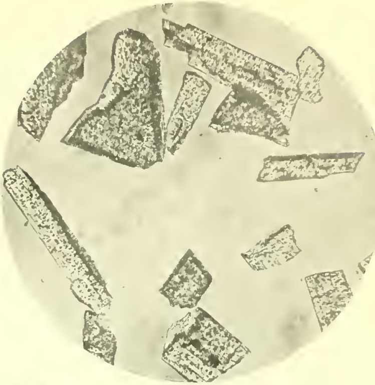

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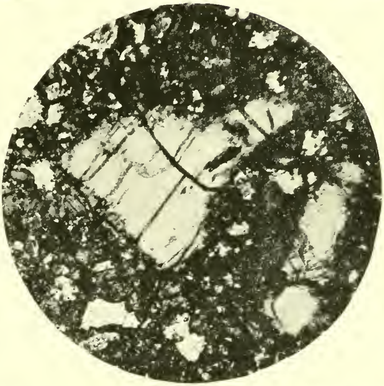

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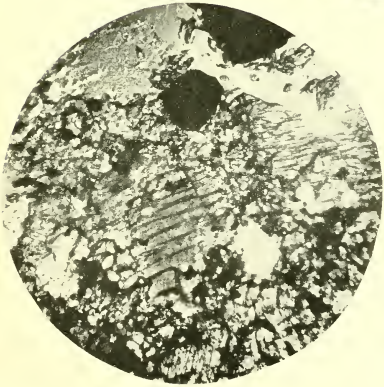

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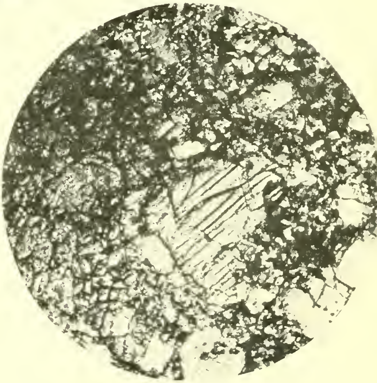
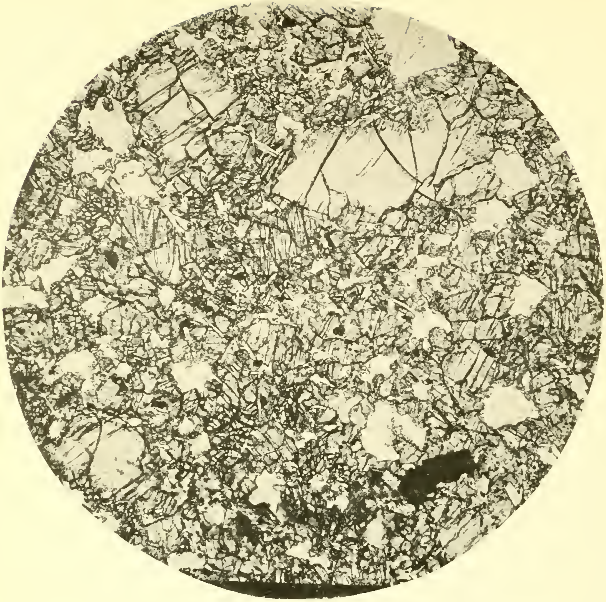


4

The Estherville, Iowa, Meteorite.

For explanation of plate see page 369.



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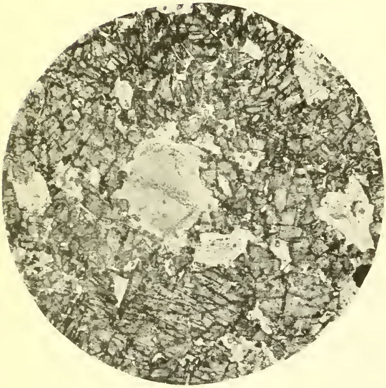
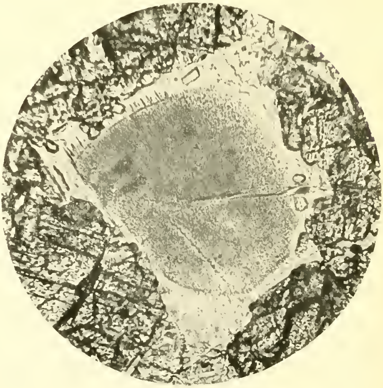


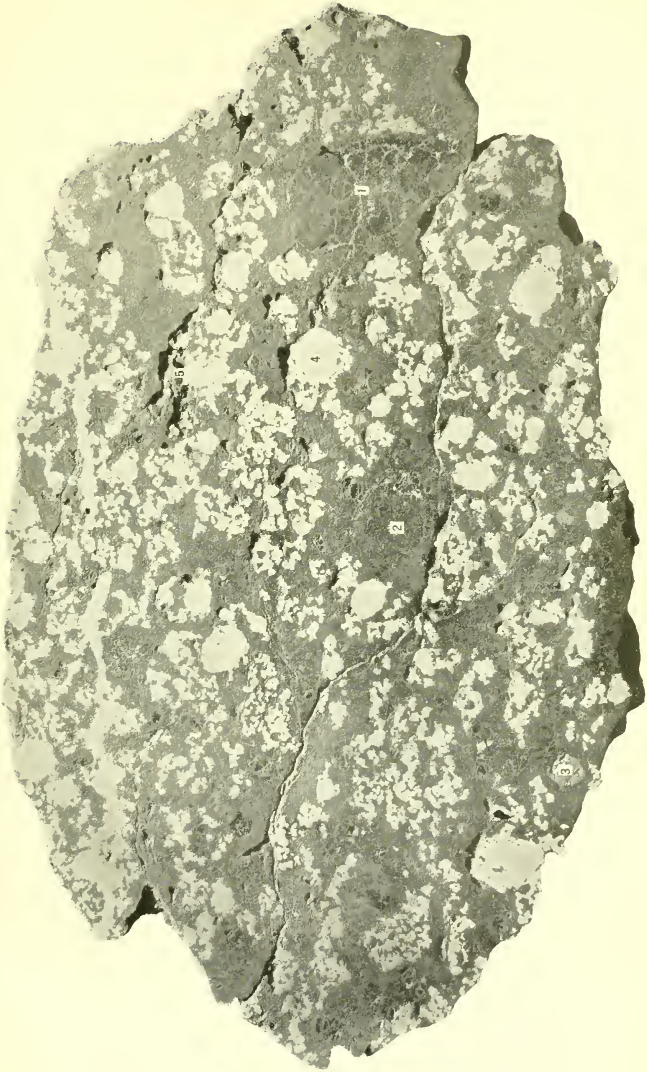
2



3

THE ESTHERVILLE, IOWA, METEORITE.

FOR EXPLANATION OF PLATE SEE PAGE 370.



THE ESTHERVILLE, IOWA, METEORITE.

FOR EXPLANATION OF PLATE SEE PAGE 370.

ANALYSES AND OPTICAL PROPERTIES OF AMESITE AND CORUNDOPHILITE FROM CHESTER, MASSACHUSETTS, AND OF CHROMIUM-BEARING CHLORITES FROM CALIFORNIA AND WYOMING.

By Earl V. Shannon,

Assistant Curator, Department of Geology, United States National Museum.

INTRODUCTION.

The present paper records work done in the laboratory of the department of geology upon several chloritic minerals as part of a general, though interrupted, study of the complicated and imperfectly understood aggregation of substances commonly referred to collectively as the chlorite group. Previous work done by the present writer upon materials of this class has already been published, including analyses and optical properties of diabantite stilpnomelane and chalcodite from Westfield, Massachusetts,[1] stilpnomelane from Lambertville, New Jersey,[2] and prochlorite from Trumbull, Connecticut, and Washington, District of Columbia.[3] These investigations have not, as yet, furnished evidence upon which to base any new theoretical views as to the chemical nature of the various members of the group and discussion of the constitution either of the individual minerals or of the group as a whole is deferred until additional work shall have explained many points which are not now clear regarding variation in chemical composition and optical properties of the several constituents of the group. The work upon these minerals will be continued as good materials come to hand, or as the need for reinvestigating individual species becomes apparent.

AMESITE FROM CHESTER, MASSACHUSETTS.

The name amesite was given by C. U. Shepard to a pale green chlorite occurring in intimate association with diaspore at the old emery mine in Chester, Massachusetts. The mineral which was analyzed by Pisani [4] is described as in hexagonal plates; foliated, resembling the green talc from the Tyrol. Hardness 2.5–3.0; specific gravity 2.71; sensibly uniaxial, optically positive; color pale apple-green; luster pearly on the cleavage face. Composition approximating to $H_4(Mg,Fe)_2 Al_2SiO_9$.

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[1] Proc. U. S. Nat. Mus., vol. 57, 1920, pp. 397-403.

[2] Idem (in press).

[3] Idem (in press).

[4] Pisani, Compt. Rendus Acad. Sci., vol. 83, 1876, p. 166.

Tschermak[1] later assumed amesite to represent a fundamental end member, and explained the constitution of the orthochlorites by assuming them to be isomorphous mixtures of the amesite molecule and the serpentine molecule. Considerable interest thus attaches to the mineral which has been found only at this exhausted locality. Since no other analysis of amesite than that of Pisani appears to have been made and in order to determine the refractive indices on analyzed material, the mineral has recently been analyzed again, abundant material for investigation being supplied by a specimen in the museum collection. This specimen is labeled "amesite and diaspore, Chester, Mass." in the handwriting of C. U. Shepard, and the label bears also the words "Coll. by E. Messia," by which is probably meant Macia, a French-Canadian, for many years foreman at the emery mine and an ardent collector of minerals. The specimen consisted of a large flat mass of diaspore showing pale grayish-pink cleavages several inches broad where broken and containing small cavities filled with interlacing needle-like crystals of diaspore. One side of the specimen is completely coated with a layer of flat amesite crystals of a pale green color somewhat iron stained. Scattered through the mass of the diaspore there are variously oriented crystals of amesite, large octahedrons of magnetite, and crystals of dark red to black rutile. The amesite occurs in tabular hexagonal crystals with dull prismatic faces. They reach an extreme diameter of 1 cm. with a thickness of 3 to 5 mm. By breaking up the diaspore, clean crystals were readily secured and these, when ground, were used for analysis. The material was perfectly homogeneous and free from impurities as shown by optical study.

The amesite has a uniform pale bluish-green color. The luster is pearly to somewhat metallic on cleavage surfaces. In thick pieces the mineral is translucent to almost opaque. Thin fragments are transparent. The powder is white with a very faint tinge of green. The mineral has a micaceous basal cleavage which, however, is not nearly so perfect as in most crystallized chlorites. Laminae are rather brittle and break in a manner suggesting a very imperfect prismatic cleavage. The hardness is about 2.3, as it scratches gypsum readily, but is scratched with great ease by calcite. The specific gravity as determined on approximately 3 grams of coarse fragments in a pygnometer is 2.77.

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[1] Theil, Sitzungsberichte Akad. Wien, vol. 99, 1890, pp. 174-267.

Under the microscope cleavage plates of the amesite are dark in all positions between crossed nicols. Examined in convergent light a black cross is obtained, which separates slightly on rotation of the stage indicating that the mineral is biaxial with the axial angle, 2V, very small, acute bisectrix normal to the perfect cleavage. The optical character is positive. The mineral is colorless as seen under the microscope. The refractive indices measured by the immersion method were found by Dr. E. S. Larsen to be as follows:

$$\alpha=1.597\pm.003$$
$$\beta=1.597\pm.003$$
$$\gamma=1.612\pm.003$$
$$\alpha-\gamma=.015\pm.003$$

Heated before the blowpipe the amesite swells somewhat and exfoliates slightly becoming silvery brownish white in color. It is infusible. It does not become magnetic when roasted on charcoal. It yields considerable water in the closed tube. The main portion of the water is basic coming off only at a dull red heat. The mineral is partially decomposed by boiling in sulphuric, nitric, or hydrochloric acid with separation of flocculent silica. Upon analysis the pure powder yields the following results:

Analysis of amesite from Chester, Massachusetts.

SiO_2	20.95
Al_2O_3	35.21
FeO	8.28
CaO	.58
MgO	22.88
MnO	Trace.
H_2O −110°C	.23
H_2O +110°C	13.02
Total	101.15

This analysis yields the following simple ratios:

Ratios of amesite from Chester, Massachusetts.

SiO_2	.3474	or	3.01	1×1.00
Al_2O_3	.3445	or	2.99	1×1.00
FeO	.1152	or	1.00	2×1.00
CaO MgO	.5779	or	5.02	
H_2O	.7355	or	6.38	2×1.06

This gives the formula—

$$2(Fe, Mg)O.Al_2O_3.SiO_2.2H_2O.$$

or Pisani's formula—

$$H_4(Mg,Fe)_2Al_2SiO_9.$$

This analysis differs from that of Pisani only in the ratio of ferrous iron to magnesia. The definite ratio of MgO: FeO = 5:1 shown by this analysis may be accidental and the percentages of these two oxides probably vary reciprocally in different specimens. The close agreement between the values found and the theoretical values is brought out in the following table:

Analyses and calculated composition of amesite.

	I.	II.	III.
SiO_2	20.95	20.82	21.40
Al_2O_3	35.21	35.28	32.30
FeO	8.28	8.27	15.80
MgO (+CaO)	23.46	23.20	19.90
H_2O	13.25	12.43	10.90
	101.15	100.00	100.30

I. Amesite, Chester, Massachusetts, analyzed by Shannon.
II. Amesite, values to conform with formula $H_4(Fe_{1}/_{6}\,Mg_{5}/_{6})_2Al_2SiO_9$.
III. Amesite, Chester, Massachusetts, analyzed by Pisani.

CORUNDOPHILITE FROM CHESTER, MASSACHUSETTS.

The name corundophilite was first given by Prof. C. U. Shepard to a chlorite occurring in association with corundum near Asheville, North Carolina. Later he referred to this species the chlorite which occurred abundantly in the emery vein of Chester, Massachusetts. Analyses by Genth and others have shown that the original North Carolina mineral is distinctly different from that of Chester, being essentially a low-iron prochlorite. The name corundophilite has since been reserved to the Chester chlorite. This mineral has been analyzed by Eaton, Pisani, and Obermayer, its optical properties have been given by Descloizeaux and Cooke, and its constitution has been discussed by Tschermak.[1] Despite the distinctness of the composition and optical properties of the mineral, it has been regarded dubiously by many mineralogists and has been variously referred to clinochlore, prochlorite, chloritoid, and biotite.

Corundophilite occurred very abundantly in the emery mine at Chester in large and small crystals and as granular and schistose masses. Hexagonal crystals often projected from the walls of narrow veins in emery and corundophilite crystals frequently were tipped with amesite in parallel position. Other minerals associated with the corundophilite include magnetite, ilmenite, rutile, margarite, and diaspore. The typical corundophilite has not been observed from any other locality.

The present examination of this mineral was undertaken in connection with the analysis of the associated amesite described in the preceding paper. Abundant material for analysis was supplied from the Abert collection in the United States National Museum. The specimen (Cat. 20,289) was collected at the mine by J. T. Ames, after whom amesite was named. It consists of a mass of granular emery coated on one side with a layer of deep-green corundophilite crystals, over and around which is a layer of pearly diaspore. The individual corundophilite crystals reach an extreme diameter of 8 mm. with a length of 5 mm. They are greenish black in color, with deeply striated prismatic planes. The cleavage surfaces are clear and brilliant and do not display any metallic or pearly luster except where bruised or weathered. Selected clean crystals were ground for analysis and the analyzed powder was shown by optical study to be pure and free from inclusions. The analysis yielded the following results:

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[1] For summary of previous work on this mineral and bibliography see Dana's System of Mineralogy, 6th edition, p. 655.

Analysis of corundophilite from Chester, Massachusetts.

Constituents.	Per cent.
Silica (SiO_2)	23.20
Alumina (Al_2O_3)	24.42
Ferric oxide (Fe_2O_3)	3.48
Lime (CaO)	1.04
Magnesia (MgO)	22.76
Ferrous oxide (FeO)	13.40
Water (H_2O)	12.00
Total	100.30

This analysis serves to confirm those previously made upon corundophilite from this locality, and to indicate that the material here described is typical. It also indicates that this chlorite varies in composition within very narrow limits and emphasizes the difference between corundophilite and most other members of the group. The ferric oxide content is noteworthy, as it seems to have been overlooked by several previous analysts, total iron being calculated as ferrous oxide, and erroneous ratios were consequently obtained for univalent and trivalent oxides. The above analysis yields the following ratios:

Ratios of corundophilite.

SiO_2	.3847	38.47	3.85	3× .98
Al_2O_3	.2389	26.07	2.61	2×1.00
Fe_2O_3	.0218			
CaO	.0185	76.95	7.70	6× .98
MgO	.5645			
FeO	.1865			
H_2O	.6661	66.61	6.66	5×1.02

These ratios may be compared with the amesite formula as follows:

$6(Mg,Fe)\ 0\ 2\ (Al,Fe)_2O_3.\ 3SiO_2.\ 5H_2O$. Corundophilite.
$6(Mg,Fe)\ 0\ 3\ (Al,Fe)_2O_3.\ 3SiO_2.\ 6H_2O$. Amesite.

Tschermak interpreted corundophilite as a molecular mixture of amesite and serpentine. In pursuance of this interpretation we may experimentally deduct from the ratios of column 2 above amesite equivalent to the total R_2O_3, thus:

$77RO.\ 26R_2O_3.\ 38SiO_2.\ 67H_2O$ or corundophilite,
minus $52RO.\ 26R_2O_3.\ 26SiO_2.\ 52H_2O$ or amesite (×26),
leaves $25RO.\ \ \ 12SiO_2.\ 15H_2O$.

The constituents remaining after deducting amesite then yield as ratios:

RO....	25	3.33	3×1.11	2× .96
SiO_2...	12	1.61	2× .80	1× .93
H_2O...	15	2.02	2×1.01	1×1.16

These ratios, considering the manner in which they were derived, are too close to those of serpentine to serve as evidence contradicting Tschermak's hypothesis. For reasons already stated, this line of speculation will not be further pursued at this place.

Optical examination has served to demonstrate the identity of the material analyzed with those examined optically by Descloizeaux and Cooke. The corundophilite is optically positive (+), biaxial with moderately large axial angle (±60°). The bisectrix is inclined about 10 degrees, so that cleavage plates do not extinguish between crossed nicols and yield unsymmetrical interference figures in convergent light. The indices of refraction as measured by immersion are:

$\alpha=1.600\pm.003$
$\beta=1.603\pm.003$
$\gamma=1.610\pm.003$
$\alpha-\gamma=\ .010\pm.003$

The pleochroism, which is marked, is as follows:

α=deep blue-green.
β=deep blue-green.
γ=pale brownish green.

Corundophilite may be readily distinguished optically from amesite then by its large axial angle and the inclination of the bisectrix to the cleavage.

CHROMIUM-BEARING CHLORITE FROM CALIFORNIA.

A specimen recently transferred to the United States National Museum by the United States Geological Survey (Cat. 93602) shows coatings of a minutely scaly material of pale grayish-lavender color associated with fine emerald-green crystals of uvarovite on granular masses of chromite. The specimen, which was collected by Mr. J. S. Diller, is from the mine of the Placer Chrome Company, 6 miles south of Newcastle, Eldorado County, California.

The coating of the lavender-colored chlorite is pure and is composed of microscopic crystals loosely aggregated, so that the masses are reduced to powder in an agate mortar by gentle pressure of the pestle. Such powder when examined optically was found to be homogeneous and free from included impurities. Upon analysis the following results were obtained:

Analyses of chromiferous chlorite from California.

	1 per cent.	2 per cent.	Average per cent.
Silica (SiO_2)	29.48	29.24	29.36
Alumina (Al_2O_3)	18.81	....	18.81
Chromic oxide (Cr_2O_3)	1.80	1.26	1.53
Magnesia (MgO)	35.82	35.52	35.67
Lime (CaO)	1.94	2.46	2.20
Ferrous oxide (FeO)	1.66	1.64	1.65
Water (H_2O)	11.34	....	11.34
Total	99.60	....	100.56

Column 3 of the above yields ratios as given in the following table:

Ratios of chromium-bearing chlorite from California.

SiO_2	0.4869	48.69	5.01	5×1.00
Al_2O_3	.1841	19.42	2.00	2×1.00
Cr_2O_3	.0101			
MgO	.8847	94.68	9.75	10× .98
CaO	.0392			
FeO	.0229			
H_2O	.6294	62.94	6.38	6×1.06

The formula derived from the analysis may then be compared with the commonly accepted formula for clinochlore as follows:

10RO	$2R_2O_3$	$5SiO_2$	$6H_2O$	California mineral.
10RO	$2R_2O_3$	$6SiO_2$	$8H_2O$	Clinochlore (Dana).

Despite the deficiency in silica and water shown by the above ratios, the analysis is similar to many which have previously been referred to the kammererite variety of clinochlore.

Under the microscope the powder is seen to be made up of well-defined hexagonal scales or prismatic aggregates of scales which appear colorless in ordinary light. Basal scales are dark in all positions between crossed nicols, so that the mineral is probably, like most chlorites, biaxial with the axial angle approaching zero, acute bisectrix normal to the perfect cleavage. Individual scales are too small to yield an interference figure in convergent light. The optical character is positive, the indices of refraction as determined by immersion being:

$$\alpha=1.582\pm.003$$
$$\beta=1.582\pm.003$$
$$\gamma=1.593\pm.003$$
$$\alpha-\gamma=.011\pm.003$$

CHROMIUM-BEARING CHLORITE FROM WYOMING.

Several specimens recently received at the United States National Museum by transfer from the United States Geological Survey consist of granular chromite containing veins and disseminated crystals of a deep purplish red chlorite. The locality from which these specimens were obtained is given as Deer Park, Wyoming. Individual crystals of the chlorite reach a maximum diameter of 1 cm. and are somewhat crumpled as from pressure. Aside from the chromite which makes up the bulk of the specimens, the only associated mineral is a brilliant green clayey substance which lines cavities in the specimens. This mineral, which is doubtless wolchonskoite, is not present in sufficient amount for analysis.

By careful hand picking the chloritic mineral was obtained for analysis free from all but a very little chromite, which under the microscope was seen to occur as minute grains between the folia of the chlorite itself. Upon analysis of this selected material the following results were obtained:

Analysis of chromium-bearing chlorite from Wyoming.

Chromite	2.04
Silica (SiO_2)	32.12
Lime (CaO)	1.24
Ferrous oxide (FeO)	1.98
Magnesia (MgO)	35.36
Alumina (Al_2O_3)	9.50
Chromic oxide (Cr_2O_3)	7.88
Water (H_2O)	10.25
Total	100.37

This analysis yields the following ratios:

Ratios of chlorite from Wyoming.

SiO_2	.5327	53.27	4× .93
Al_2O_3	.0930	14.48	1×1.00
Cr_2O_3	.0518		
MgO	.8770	90.67	6×1.06
CaO	.0221		
FeO	.0276		
H_2O	.5689	56.89	4×1.00

The ratios derived from the analysis then yield the formula:

$$6(Mg, Fe)O.\quad (Al, Cr)_2O_3.\quad 4SiO_2.\quad 4H_2O,$$

which may be compared with the clinochlore formula as follows:

6RO	R_2O_3	$4SiO_2$	$4H_2O$	Wyoming chlorite.
5RO	R_2O_3	$3SiO_2$	$4H_2O$	Clinochlore (Dana).

This, like the preceding chromium bearing chlorite from California while differing from the formula usually assigned to clinochlore, is similar to several chrome-chlorites which have been referred to kammererite or kotschubeite.

Under the microscope the present mineral is biaxial and negative, with a very small optic axial angle, and having the acute bisectrix normal to the perfect cleavage. Basal plates are dark in all positions between crossed nicols. The indices of refraction are:

$$\begin{aligned} \alpha &= 1.587 \pm .003 \\ \beta &= 1.590 \pm .003 \\ \gamma &= 1.590 \pm .003 \\ \alpha - \gamma &= .003 \pm .003 \end{aligned}$$

The mineral is distinctly pleochroic, the scheme being:

α=pale red purple.
β=red purple.
γ=red purple.

Under existing classifications both the above chromium-bearing chlorites would be referred to clinochlore, or to the chromium-bearing varieties kammererite and kotschubeite. These two examples serve to illustrate the wide variation, not only in chemical composition, but also in indices of refraction which may exist between different specimens now included under the same species. It is highly desirable that optical properties, especially refractive indices, be in all cases determined upon analyzed material if work on minerals of this sort is to be made of any value in the interpretation of isomorphous relationships.

ADDITIONS TO WEST INDIAN TERTIARY DECAPOD CRUSTACEANS.

By Mary J. Rathbun,
Associate in Zoology, United States National Museum.

Among the crustaceans obtained in the Dominican Republic by Dr. T. Wayland Vaughan and party in 1919 are three forms not previously known. Two belong to *Nephrops*, a genus not before recorded in the West Indies, and the other is a *Portunus* which appears different from other fossil forms.

NEPHROPS MAOENSIS, new species.

Plate 25, figs. 2 and 2*a*.

Material.—Tips of two fingers, from the Rio de Mao, 3 miles above Paso Bajito, at Cercado de Mao, Dominican Republic; Cercado formation; lower Miocene; T. W. Vaughan and C. W. Cooke, collectors (8525). Cat. No. 328230, U.S.N.M.

Description.—One of these pieces, holotype, is more than twice as long as the other and resembles the tip of a major, immovable finger of *N. norvegicus* (Linnaeus)[1] in the shape, which is nearly straight until near the tip where it turns rapidly inward. The surface, except on the prehensile edge is smoothly rounded, not longitudinally furrowed as in *norvegicus*. The prehensile edge has five teeth, which are stout, blunt, and of a reddish-brown color, lighter at the tip than at the base; the tooth nearest the broken end is of medium size and slightly broader than long; separated by a narrow interval there is a much larger tooth than the first; it is longer than wide, and subparallel to the finger tip, which is slenderer and sharper; between the large tooth and the tip, but much nearer the former there are three very small teeth, the three interspaces subequal and a little wider than that between the two largest teeth; of the small teeth the two distal ones are subequal and are shorter and narrower than the more proximal one. The main part of the finger is a light tan color and is covered with microscopic granules; the long tip is dark brown, which extends as far back as the third small tooth. The surface is sparingly dotted with punctae, arranged partly in longitudinal rows, one row of a few distant punctae extending through the middle of the upper, and another through the middle of the lower surface.

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[1] *Cancer norvegicus* Linnaeus, Syst. Nat., ed. 10, vol. 1, Holmiae, 1758, p. 632.

The smaller specimen, paratype, belongs to the chela of a smaller individual than the holotype and shows very little besides the dark-colored end of the finger; five teeth are present, but are more crowded than in the larger finger; the two larger teeth are relatively much smaller and both are broader than long.

Relationship.—These fingers have little resemblance to any fossil species figured, but are akin to *N. norvegicus*, as stated above. If the correspondence in the dentation of the fingers of the two species is a dependable character, the holotype finger is a right, major, immovable finger; the other a left, major, immovable one. In both fingers the three smallest teeth are nearer the upper than the lower surface which is not true of the small teeth of *norvegicus*.

NEPHROPS AEQUUS, new species.

Plate 25, figs. 1–1c.

Material.—Portion of a right manus and base of immovable finger (holotype); and a short section of a finger discontinuous with the holotype. From second bluff on left side of Rio Mao, about 2 or 2½ miles by trail above the ford (Paso Bajito) at Cercado de Mao, Dominican Republic; Cercado formation; lower Miocene series; T. W. Vaughan and C. W. Cooke, collectors (8526). Cat. No. 328231, U.S.N.M.

Description.—Manus about 10 mm. wide at base of fingers, proximal end missing, so that length can not be estimated; much depressed, not more than 3 mm. thick at distal end and 4¼ mm. thick at proximal (fractured) end; widening rapidly toward fingers, outer margin straight, inner margin slightly arcuate; upper surface with three irregular rows of tubercles with depressed interspaces; a row of tubercles near each margin, the intermediate row much nearer the inner than the outer row; lower surface with three longitudinal rows of distant punctae, the rows equidistant from one another and from the margins. The base of the immovable finger is much depressed and bears four teeth on its prehensile edge, the third tooth, counting from the manus, being enlarged, and in profile wider at its base than it is long, from base to tip; both upper and lower surfaces show three lines of punctae and a longitudinal depression just within the outer margin.

The separate short section of finger, bearing four teeth, if it belongs to the same chela as the holotype, came from the movable finger or dactylus.

Relationship.—I have placed this form in a separate species from the preceding on account of its thin, flattened finger, the propodal finger of *maoensis* being subcylindrical, or almost circular in cross section.

PORTUNUS OBLONGUS, new species.

Plate 25, figs. 3 and 3*a*.

Material.—One carapace of male, with sternum and abdomen, and bases of maxilliped, of chelipeds and of first two ambulatory legs; from bluff on right bank of Rio Mao, about 1½ to 2 miles above Paso Bajito at Cercado de Mao, Province of Santiago, Dominican Republic; Cercado formation; lower Miocene series; May 4, 1919; T. W. Vaughan and C. W. Cooke, collectors (8522; C–28–19). Fossil from 15 to 30 feet above water. Cat. No. 328229, U.S.N.M.

Description.—Anterior part of carapace missing as far back as the line at the anterior base of the fifth lateral tooth. The last four small lateral teeth are more or less completely preserved, the spines at the lateral angles are large, but are broken off near the base. The carapace is very uneven and shows granulations especially on the teeth and on the postlateral margin; it is unusually wide, 104 mm. measured in front of lateral spine, while the distance from the same point to the anterior base of the fifth tooth is only 22.1 mm. The fifth tooth has a convex posterior and a concave anterior margin.

The ischium of the right maxilliped shows a deep furrow, which is situated near the inner third and does not reach the posterior end. The cross section of the ischium of the cheliped is triangular and indicates a very stout segment.

The sternum between the chelipeds is extremely wide, giving the whole sternum a more oblong shape than usual; its margin opposite the anterior base of the cheliped bears a few granules; sternum in front of the articulating condyle of the cheliped depressed, the line between the depression and the elevation behind it being transverse, not V-shaped. The abdomen, exclusive of the first two segments, is triangular; the length of the coalesced segment (third, fourth, and fifth combined), measured on the median line, from the transverse ridge to the distal end is two-thirds of its distal width; the sixth segment is half as wide on its distal as on its proximal margin, while the length is three-fourths of the proximal width; terminal segment triangular, its width a little greater than its length.

Relationships.—This specimen compared to the male of *P. gabbi*,[1] has a wider carapace and a different shaped lateral tooth; in *gabbi* the fifth lateral tooth is convex on its posterior margin at the base only, becoming suddenly slender toward the tip; the abdomen of *gabbi*, so far as it is visible, is wider and more oblong.

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[1] Rathbun, Publ. No. 291, Carnegie Inst., Washington, 1919, p. 172, pl. 3, figs. 2–7; pl. 6, figs. 1–2.

The other species of *Portunus* described from the same region, *Portunus tenuis*[1] and *Portunus,* indeterminable species,[2] were based on fingers only.

(*oblongus,* oblong, referring to the sternum.)

ADDITIONS TO THE BIBLIOGRAPHY OF WEST INDIAN TERTIARY DECAPODA.

1863–64. Edwards, Alphonse Milne. Monographie des Crustacés Fossiles de la Famille des Cancériens. [Part 2], Ann. Sci. Nat., ser. 4, Zool., vol. 20, Paris, 1863, pp. 273–324, pls. 5–12; [Part 3], Ann. Sci. Nat., ser. 5, Zool , vol. 1, Paris, 1864, pp. 31–88, pls. 3–9.

This monograph, which appeared in four parts, is devoted to Old World species with one exception, *Lobonotus sculptus* A. Milne Edwards, from San Domingo. This is figured in vol. 20, 1863, pl. 10, figs. 1, 1*a*, 1*b*, and described in vol. 1, 1864, p. 40. It is the same as my *Archaeopilumnus caelatus* (Publ. No. 291, Carnegie Inst., Washington, 1919, p. 177, pl. 6, figs. 6 and 7; pl. 7, figs. 10–13; pl. 8, figs. 4–7). The genus *Archaeopilumnus* is, therefore, a synonym of *Lobonotus.* This genus appears to me nearer the Pilumninae than the Xanthinae where Milne Edwards placed it; the presence or absence of palatal ridges defining the efferent branchial channels is still to be determined.

1912. Maury, Carlotta Joaquina. A contribution to the Paleontology of Trinidad. Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 15, pp. 25–112, pls. 5–13. Published in Commemoration of the One Hundredth Anniversary of the Founding of the Academy, March 21, 1912.

One crustacean is listed and figured, *Ranina porifera* Woodward (p. 106, pl. 13, fig. 23), from Farallon Rock or Johnson's Island, near San Fernando, Trinidad, in the Gulf of Paria, lower Oligocene.

EXPLANATION OF PLATE 25.

The figures are from photographs made by the United States Geological Survey.

Figs. 1–1*c*. *Nephrops aequus*, × 2.
- 1. Holotype, right manus, ventral view.
- 1*a*. Portion of a finger, ventral view.
- 1*b*. Holotype, right manus, dorsal view.
- 1*c*. Dorsal view of 1*a*.

2, 2*a*. *Nephrops maoensis*, × 3.
- 2. Paratype, end of a left, major, immovable finger, dorsal view.
- 2*a*. Holotype, distal half of a right, major, immovable finger, dorsal view.

3, 3*a*. *Portunus oblongus*, holotype, nat. size.
- 3. Dorsal view.
- 3*a*. Ventral view.

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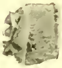
[1] Rathbun, Publ. No. 291, Carnegie Inst., Washington, 1919, p. 173, pl. 7, fig. 7.

[2] Idem, p. 174.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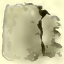
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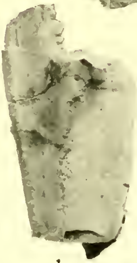
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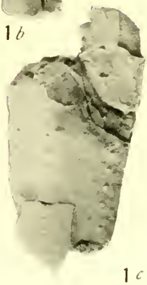
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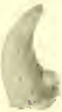
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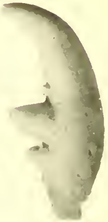
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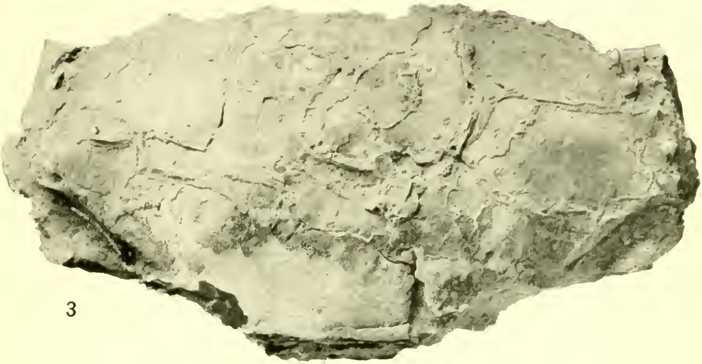
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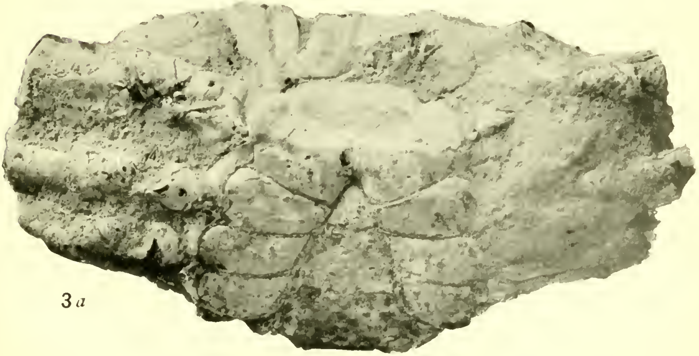
3 *a*

WEST INDIAN TERTIARY DECAPODS.

FOR DESCRIPTION OF PLATE SEE PAGE 384.

DIPTERA OF THE SUPERFAMILY TIPULOIDEA FOUND IN THE DISTRICT OF COLUMBIA.

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and
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Of the United States Biological Survey.

INTRODUCTION.

The present contribution to a series of lists of District of Columbia Diptera includes the Tipulidae and three smaller families closely related to them. Inclusion of families of lesser with those of greater importance—in other words, making the superfamily[1] the unit of the list—is deemed good policy, as it will avoid having finally left over for treatment a miscellaneous lot of the smaller families.

The fragile, long-legged flies that are known commonly to American naturalists as crane-flies, are called by a variety of local or regional names. In Britain their almost universal name is "daddy longlegs"—a term in this country applied to the Phalangidae or harvest-men. In northern Scotland they are often called "spinners"; in south-central Scotland, "jenny meggies," only the larger species being known as crane-flies. In parts of the United States the larger species are called "gallinippers" and are greatly feared by certain individuals, who mistake them for giant mosquitoes. In parts of the Southern States the large dancing crane-flies pass by the name of "weavers." The large, thick-bodied, tough-skinned larvae of the larger crane-flies are sometimes called "leather-jackets."

Crane-flies abound in almost all parts of the world, being restricted only by intense cold and dryness. Water or moisture is a necessary condition for the development of the immature stages of most species of Tipulidae, and as a result extensive deserts or plains form efficient barriers to their dispersal. Nearly 3,000 species of crane-flies have already been made known to science and many others remain to be described. Many species are comparatively local in their distribution, but a few species are very widespread, especially *Helobia hybrida*, which ranges over most of Asia, Europe, and the New World, and *Dicranomyia longipennis*, which ranges in a wide belt around the world in the North Temperate Zone. As in many other groups of insects most of the local species of Tipulidae are very seasonal in their appearance, there being vernal, early summer, midsummer, and autumnal species, as well as others that fly throughout most of the summer, and still others that are undoubtedly double-brooded, one brood occurring in the spring, the second in late summer. The larger number of Tipulidae in the vicinity of Washington are on the wing during the month of June. Many of the larger species of crane-flies, belonging to the genera *Tipula* and *Nephrotoma*, are of considerable economic importance, the larvae devouring the roots of various plants, often killing the vegetation over large areas.

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[1] In this respect the classification of J. R. Malloch is followed. See A Preliminary Classification of Diptera, etc., Part 1, Bull. Ill. State Lab. Nat. Hist., vol. 12, art. 3, March, 1917, p. 182.

Crane-flies inhabit a variety of situations, although, as mentioned previously, most species require wet or moist conditions for their development. The adult flies are commonly met with along streams or in woods where the larvae occur beneath the thick layer of leaf mold. They may be swept from low vegetation growing in such haunts. It may be noted that the situations frequented by crane-flies are usually preferred by species of dance-flies, Empididae, both of these great groups being rare in species or individuals in dry or desert conditions. Many crane-flies are found along cliffs or rocky walls of gorges, such as are found in the various runs along the Potomac. Such forms, as *Dicranomyia simulans*, *D. badia*, some *Geranomyia*, *Limnophila montana*, many *Oropeza* and others, are found resting on the rocky walls or hanging in crevices or crannies in the cliffs. The species that are found in wet meadows and open swales are largely distinct from the species occurring in woods and in shaded swamps. Moreover, the Tipulid fauna of high, dry upland woods is rather peculiar, consisting almost entirely of many species of the genus *Tipula*, with very few of the smaller Limnobine crane-flies (as *Dicranoptycha*, *Cladura*, etc.). The crane-flies of the bogs, such as are found near Beltsville, and those frequenting cypress swamps, are often peculiar to such situations. The immature stages of these insects frequent a variety of habitats that are indicated in some detail under the various generic accounts in this paper. The authors, on a collecting trip taken July 25, 1915, along the Potomac, by way of Dead, Scott's, and Difficult Runs, secured a total of 48 species of these insects. When it is considered that the height of the collecting season for these flies in this vicinity is mid-June or earlier, it will be appreciated that the Tipulid fauna of the District is very rich indeed.

The Tipulidae and their allies of the vicinity of Washington, D. C., are a particularly interesting group for study, for the reason that so many of the species were originally described from here. No fewer than 87[1] species of crane-flies have been described from material wholly or in part from our region—a record due chiefly to the zealous entomological activities of C. R. Osten Sacken.

This gentleman was secretary to the Russian legation in Washington from 1856 to 1862, and lived elsewhere in the United States, most of the time up to the year 1877. Of this period he says:[2]

> These 21 years were, as regards entomology, principally devoted, in collaboration with Dr. H. Loew, to the task of working up the Diptera of North America.[2]

With reference to Washington scientists whom he met, Osten Sacken speaks in the highest terms of Spencer F. Baird, then secretary of the Smithsonian Institution, and takes occasion "to pay a tribute of heartfelt gratitude and admiration to Baird, to whose encouragement, support, and example," he says, "I owe a considerable share of my success." (P. 9.)

"Among other men of science," Osten Sacken adds, "who have been useful to me in contributing to my studies on *Cynipidæ*, I owe a debt of gratitude to Mr. E. Foreman, of the United States Patent Office in Washington, with whom (between 1856 and 1861) I took frequent walks in the environs of that city. He taught me to distinguish the numerous species of oaks occurring in the United States, and procured me many new galls and other vegetable deformations." (P. 41.)

The period mentioned was that of Osten Sacken's collecting activities about Washington; publication of the results came later. One of Osten Sacken's favorite collecting grounds was the Smithsonian Park and westward parts of the Mall, then a nearly natural forest. Those who have seen him collecting crane-flies say that his favorite implement for catching them was the collecting forceps, in the use of which he was incredibly adept. Specimens caught were pinned on the spot, and placed in a box carried for the purpose, or in a cork lining of his high hat. Osten Sacken collected more than 120 species of crane-flies in the District of Columbia region, of a large proportion of which he published the original descriptions. The descriptions of 50 species recognized nowadays were based either wholly or in part upon local material.

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[1] Designated by asterisks in the list. In such cases the data, if only Washington, D. C., or District of Columbia is not repeated among the records.

[2] Record of my life work in entomology. 1903–4, p. 3.

Of the total number of species of crane-flies in the following list 85 were described by Osten Sacken, 38 by Alexander, 25 by Loew, 15 by Say, 12 by Johnson, and the remainder by a number of other entomologists. Of the species that were originally described from District of Columbia material six have not been re-collected here. These species are:

Tipula fragilis Loew; *Tipula grata* Loew; *Tipula ignobilis* Loew. *Ormosia holotricha* Osten Sacken; *Ormosia nigripila* Osten Sacken; *Tricyphona vernalis* Osten Sacken.

Comparisons of the present with other local lists may be noted as follows:

From New England there have been recorded 240 species; from New York, 272; from New Jersey, 165; District of Columbia, 201; North Carolina, 116; and from Florida, 45. In comparing these lists it must be borne in mind that the species of crane-flies are very much more numerous in the northern part of the United States than in the Southern States, which accounts for the small list from Florida and the relatively large one from New York.

With respect to local distribution of the crane-flies hereafter listed it may be said that 83 species, so far as collected, occur only in the Piedmont Region and 11 in the Coastal Plain.[1] These figures indicate that our crane-fly fauna has much stronger affinities with northern and upland than with southern and lowland faunas. Of the 11 species collected only in the Coastal Plain three, (*Dicranomyia gladiator*, *Rhamphidia mainensis*, and *Limnophila niveitarsis*) are northern forms, which, like numerous northern plants, etc., find the most favorable habitat in this region, in the Magnolia bogs of the Coastal Plain.[2] One of the craneflies also (*Molophilus nova-caesariensis*) illustrates the relationship of these bogs to the Pine Barrens.

For those especially interested in the fauna of Plummers Island, Maryland, it may be stated that 91 species of Tipuloidea have been collected on that Island, and 66 others in the Great Falls–Little Falls section of the Potomac River Valley. Where distribution with respect to Plummers Island is not indicated by the records quoted it is denoted by the initials P. I. and V. P. I. (vicinity of Plummers Island).

For records of specimens, access to collections, and other help in the preparation of the following list the writers are indebted to Dr. J. M. Aldrich and Messrs. Nathan Banks and Charles T. Greene.

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[1] For explanation of these terms, see Bull. 1, Biol. Soc. Wash., A Sketch of the Natural History of the District of Columbia, etc. 1918. Pp. 57–74.

[2] Idem, p. 81.

KEY TO FAMILIES OF SUPERFAMILY TIPULOIDEA.

1. Five branches of the radius reaching the wing margin; a single anal vein[1]___ TANYDERIDAE (p. 389).
   Less than five branches of the radius reaching the wing margin; one or two anal veins____________2.
2. Ocelli present____________RHYPHIDAE (p. 390).
   Ocelli lacking____________3.
3. A single anal vein____________PTYCHOPTERIDAE (p. 389).
   Two anal veins____________TIPULIDAE (p. 392).

Family TANYDERIDAE.

Genus PROTOPLASA Osten Sacken.

PROTOPLASA FITCHII Osten Sacken.

The adults of this rare fly have never been taken in the ordinary accepted limits of the District of Columbia fauna, but are regional, having been secured in greatest numbers in North Carolina and New York. The nearest point of capture is Camp Meade, Maryland, where a specimen was taken in May, 1918, by R. C. Shannon. A curious dipterous larva that is referred to this species with considerable confidence was found in late May, 1916, by Messrs. H. S. Barber, Charles T. Greene, and R. C. Shannon in a much decayed drift log of soft maple near the mouth of Dead Run, opposite Plummers Island, where they were associated with larvae of the wood-boring syrphid, *Temnostoma bombylans*, and a crane-fly, *Epiphragma solatrix*. Larvae were again found on May 27, 1917, by H. L. Viereck, who sent one large larva to Ithaca, New York, where it was placed in a rearing cage, but died soon thereafter.

Family PTYCHOPTERIDAE.

KEY TO GENERA.

1. Antennae with 16 segments; legs not banded with black and white; two branches of media reaching the wing margin________*Ptychoptera* (p. 389).
   Antennae with more than 16 segments; legs conspicuously banded with black and white; a single branch of media reaching the wing margin____2.
2. Metatarsi not swollen; apical cells of the wing pubescent________________ *Bittacomorphella* (p. 390).
   Metatarsi conspicuously swollen; apical cells of the wings not pubescent_____ *Bittacomorpha* (p. 390).

Genus PTYCHOPTERA Meigen.

PTYCHOPTERA RUFOCINCTA Osten Sacken.

This is the only regional species. The pale brownish-white larvae live in wet organic mud, often associated with the larvae and pupae of *Bittacomorpha clavipes*. The adults are common about swamps; extreme dates of collection are May 8 and August 15; in copulation, July 16; at honey-dew on tulip tree, July 4, 1917, McAtee. V. P. I.

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[1] For explanation of the venational terms used in the keys in this paper see plate 23 and its legend, on page 435.

Genus BITTACOMORPHELLA Alexander.

BITTACOMORPHELLA JONESI Johnson.

The pygmy phantom crane-fly is a very local species. The curious short black larva lies in rich organic mud in cold woods. This species has been taken at Glencarlyn, Virginia, by Nathan Banks.

Genus BITTACOMORPHA Westwood.

BITTACOMORPHA CLAVIPES Fabricius.

The phantom crane-fly is one of the most common species of the Tipuloidea. The curious rust-brown larvae live in organic matter and mud in open swamps and swales. Adults have been collected in all parts of the Washington region, at dates ranging from April 6 to October 8; in copulation, April 12, October 8. The species is attracted at light. V. P. I.

Family RHYPHIDAE.

KEY TO GENERA.

1. Cell *1st* M_2 lacking------------------------------------*Mycetobia* (p. 390).
   Cell *1st* M_2 present--2.
2. A single anal vein; two branches of the radial sector reaching the wing margin---*Rhyphus* (p. 390).
   Two anal veins; three branches of the radial sector reaching the wing margin---*Trichocera* (p. 391)

Genus MYCETOBIA Meigen.

MYCETOBIA PERSICAE Riley.

Numerous specimens bred from gum and frass from around bases of peach trees where the peach-tree borer had been working, Arlington, Virginia, October, 1915, W. B. Wood.

Genus RHYPHUS Latreille.

KEY TO SPECIES.

1. The two veins that form the outer end of cell *First* M_2 subequal, or the basal deflection of M_2 longer than m; a faint yellowish blotch at the end of *Sc*; brown wing markings extensive, including the wing apex----------------2.
   The basal deflection of M_2 usually punctiform, much shorter than m; no yellowish blotch at the end of *Sc*; brown wing markings scanty, appearing as about three blotches on the basal two-thirds, the outermost lying at the tip of R_1, the wing apex clear--------------------------------*R. punctatus*.
2. Wing pattern clear cut, the brown markings extensive; the subapical drop white or hyaline, sharply delimited; *r–m* at nearly two-thirds the length of cell *first M*--*R. alternatus*.
   Wing pattern more diffuse, the brown markings less extensive, the subapical drop subhyaline to grayish, not clearly delimited; *r–m* at about one-half the length of cell *first M*. (Regional)--------------*R. fenestralis* Scopoli.

RHYPHUS ALTERNATUS Say.

Common; dates of collection range from February 28 to July 23; has been bred from decayed fungus; comes to sap. P. I.

RHYPHUS PUNCTATUS Fabricius.

Virginia near Plummers Island, September 4, 1903, H. S. Barber; Plummers Island, April 23, 1914, R. C. Shannon; Falls Church, Virginia, July 11, 1912; August 9, 1917, reared from cow dung, C. T. Greene; June 7, 1914, R. C. Shannon.

Genus TRICHOCERA Meigen.

The genus Trichocera at this time presents almost insuperable taxonomic difficulties. The keys and determinations here given must therefore be considered as tentative. The immature stages occur in decaying organic matter.

KEY TO SPECIES.

1. Wings more or less distinctly marked with darker..........2.
   Wings unmarked, hyaline or subhyaline..........3.
2. Wings with two brown clouds, one near the origin of the sector, the other at *r–m*..........*T. bimacula* (p. 391).
   Wings with a very faint brown cloud at *r-m* and less distinct clouds along with branches of *Cu*..........*T. regclationis* (p. 391).
3. Mesonotum brownish gray with four brown stripes; wings grayish subhyaline..........*T. hiemalis* (p. 391).
   Mesonotum clear gray with two stripes indicated only on the anterior portion of the sclerite; wings nearly hyaline. (Regional)..*T. brumalis* Fitch.

TRICHOCERA BIMACULA Walker.

The specimens determined as this species were collected at Washington, District of Columbia, November 18, 20, 1913, F. Knab; November 23, 1906, McAtee; January 5, 1906, Alexander; and at Plummers Island, November 2, 1903, E. A. Schwarz and H. S. Barber; October 27 and December 31, 1906, A. K. Fisher.

TRICHOCERA HIEMALIS De Geer.

Washington, District of Columbia, November 4, 1906, F. Knab.

TRICHOCERA REGELATIONIS Linnaeus.

Washington, District of Columbia, March 29, 1907, McAtee; Plummers Island, February 24, 1903, R. P. Currie.

Family TIPULIDAE.

KEY TO SUBFAMILIES AND TRIBES.

1. Last segment of the maxillary palpi elongate, whiplash-like; nasus usually distinct; antennae usually with 13 segments; *Sc* almost always ending in *R; m–cu* present or obliterated by the usually slight fusion of Cu_1 *on* M_3. (In *Brachypremna, Sc* is unusually long and ends in costa and the fusion of Cu_1 and M_3 is rather extensive, but the antennae are 13-segmented, the palpi elongate, and the nasus distinct) ---------- *Tipulinae* 2.

Last segment of the maxillary palpi short; no distinct nasus; antennae usually with 14 or 16 segments; *Sc* ending in C but connected with *R* by Sc_2; *m-cu* obliterated by the long fusion of *Cu*, on M_3. (*Pedicia* has the palpi elongate but all other features are essentially Limnobiine.) ---------- *Limnobiinae; Cylindrotominae* 4.

2. Vein R_2 obliterated by atrophy, or (*Brachypremna*), the second anal vein very short, not more than one-third the length of the first anal vein; legs very long and slender ---------- *Dolichopezini* (p. 393).

Vein R_2 present for its entire length; second anal vein longer, about one-half of the length of the first or more; legs usually shorter and stouter -- 3.

3. Antennae without verticils; flagellum of the male antennae pectinate ---------- *Ctenophorini* (p. 394).

Antennae verticillate; flagellum of the male antennae not pectinate ---------- *Tipulini* (p. 395).

4. Four branches of radious reaching the wing margin. (In *Gonomyia blanda*, R_2 runs close to R_1 at the margin so but three branches appear to attain the margin) ---------- 5.

Two or three branches of radius reaching the wing margin ---------- 9.

5. Tibiae spurred at tip ---------- 6.

Tibiae without spurs at tip ---------- *Eriopterini* (p. 416).

6. Antennae with from 6 to 10 segments ---------- *Hexatomini* (p. 428).

Antennae with more than 10 segments ---------- 7.

7. Sc_2 beyond the origin of *Rs* ---------- *Limnophilini* (except *Ula*) (p. 423).

Sc_2 before the origin of *Rs* ---------- 8.

8. Antennae 17-segmented; wings entirely pubescent ---------- *Ula* (*Limnophilini*) (p. 423).

Antennae with from 13 to 16 segments ---------- *Pediciini* (p. 429).

9. Tibiae spurred; an apparent fusion of R_{1+2+3} to the wing margin, so that but two branches of the radius are present ---------- *Cylindrotominae* (p. 432).

Tibiae without spurs (In the genera *Atarba* and *Elephantomyia* of the Antochini, the tibiae bear small spurs, but the venation is not as in the Cylindrotominae.) Veins R_1 and R_{2+3} not contiguous at their tips.

10. Antennae with 12, 15 or 16 segments; claws usually without teeth on their lower side, or at most with a single subbasal tooth ---------- 11.

Antennae with 14 segments; claws with teeth on their lower side ---------- *Limnobiini* (p. 407).

11. Crossvein *r* lacking; *Sc* ending before the origin of the short *Rs*; R_{2+3} upcurved at the end; R_{4+5} bent strongly toward the wing apex, producing a trumpet-shaped cell R_5; cell *1st* M_2, if present, pointed at its inner end. *Leiponeura* (genus *Gonomyia*) (p. 420).

Crossvein *r* present or lacking; if the latter, *Sc* ends far beyond the origin of *Rs*; R_{2+3} not strongly upcurved at the end; R_{4+5} not bent strongly toward the wing apex; inner end of cell *1st* M_2, if present, not pointed ---------- ***Antochini*** (p. 413).

Tribe DOLICHOPEZINI.

KEY TO GENERA.

1. Tip of vein R_2 atrophied; *Rs* very short, transverse, simulating a cross-vein; second anal vein long, about two-thirds the length of the first; *Sc* moderate in length, ending in *R*------------------------*Oropeza* (p. 393).
   Tip of vein R_2 present, the vein almost perpendicular to R_{2+3} at its origin; *Rs* long, strongly arcuated at its origin; second anal vein very short, about one-third the length of the first; *Sc* very long, ending in *C*-------------- *Brachypremna* (p. 394).

Genus OROPEZA Needham.

KEY TO SPECIES.

1. Tarsi, at least, entirely white--2.
   Tarsi yellow or brownish---3.
2. Digitiform appendages of the male hypopygium short or rudimentary; ventral margin deeply and narrowly emarginate----*O. albipes* (p. 393).
   Digitiform appendages of the male hypopygium moderate in length; ventral margin broadly emarginate----------------------*O. subalbipes* (p. 393).
3. Halteres with the knobs dark brown--4.
   Halteres entirely yellowish-----------------------------*O. sayi* (p. 393).
4. Stripes of the thorax distinct; pleura spotted---------*O. dorsalis* (p. 393).
   Stripes of the thorax obscure; pleura dark-------------------------------5.
5. Thorax opaque--------------------------------------*O. obscura* (p. 393).
   Thorax shining--*O. obscura polita.*

The above key is adapted from one by Johnson. *O. subalbipes* is distinguished with difficulty from *O. albipes.* The immature stages of the species of *Oropeza* are spent in usually dry moss or in soil.

OROPEZA ALBIPES Johnson.

Common; season May 30 to August 25. P. I.

OROPEZA DORSALIS Johnson.

Washington, District of Columbia, June 11, 1910, F. Knab; Plummers Island, June 19, 1913, at light, R. C. Shannon; August 18, 1912, J. R. Malloch.

OROPEZA OBSCURA Johnson.

Common; season May 17 to August 30; in copula June 7. The variety *polita* Johnson was taken from a spider's web at Rosslyn, Virginia, August 25, 1912, F. Knab. P. I.

OROPEZA SAYI Johnson.

Plummers Island, July 31, 1912, E. A. Schwarz and H. S. Barber; August 25, 1904, R. P. Currie.

OROPEZA SUBALBIPES Johnson.

Specimens identified as this form were taken at Dead Run, Virginia, July 21, 1915, Virginia near Plummers Island, July 14, 1915, Four-mile Run, Virginia, May 31, 1914, McAtee; June 7, 1914, L. O. Jackson; Beltsville, Maryland, June 9, 1915, June 14, 1914; and Odenton, Maryland, June 20, 1915, McAtee.

Genus BRACHYPREMNA Osten Sacken.

BRACHPYREMNA DISPELLENS Walker.

On account of its mazy dancing flight, this species is sometimes called the "weaver." The immature stages are spent in decaying wood. The large adults are fairly common in our region, the dates of collection ranging from June 26 to August 11; in copula, July 2. P. I.

Tribe CTENOPHORINI.

KEY TO GENERA.

1. Antennæ of the male with three pectinations on each flagellar segment, a single pectination on the apical half in addition to the usual basal pair; ovipositor of the female greatly elongated, saber-like__*Tanyptera* (p. 394).
   Antennæ of the male with two pairs of pectinations on each flagellar segment, one pair being subbasal and the other subapical; ovipositor of the female short and of normal Tipuline structure______*Ctenophora* (p. 394).

Genus TANYPTERA Latreille.

KEY TO SPECIES.

1. Wings smoky black, body coloration black, the male with the feet and abdomen also black, the female with the feet and base of the abdomen reddish yellow___________________________________*T. fumipennis* (p. 394).
   Wings not black____2.
2. Wings tinged with topazine yellow, the stigma dark brown; body coloration varying from black to yellow, the feet reddish yellow. (Regional)______ *T. topazina.*
   Wings hyaline, the stigma brown; head black, body coloration varying from black to yellow_______________________________________*T. frontalis* (p. 394).

The immature stages of species of this genus are spent in wood that is relatively sound, the larvae tunneling through the bark and xylem.

TANYPTERA FRONTALIS Osten Sacken.

Plummers Island, May 28, 1916, H. L. Viereck.

TANYPTERA FUMIPENNIS Osten Sacken.

Great Falls, Virginia, May 24, 1915, C. T. Greene; May 23, 1918, McAtee; Dead Run, Virginia, May 21, 1916, R. C. Shannon; May 25, 1916, T. A. Keleher; May 27, 1917, F. C. Craighead; Plummers Island, April 12, 1915, bred from maple log, R. C. Shannon; May 29, 1902, Geo. P. Engelhardt; June 7, 1913, H. S. Barber.

Genus CTENOPHORA Meigen.

KEY TO SPECIES.

1. Wings with the entire apex beyond the cord tinged with blackish. (Regional.)____*C. apicata* Osten Sacken.
   Wings nearly hyaline, with a large brown cloud between the cord and the wing tip but not reaching the apical margin. (Regional.)_______________. *C. nubecula* Osten Sacken.

These species are locally common where found but have not yet been collected in our region. Their immature stages occur in decaying wood.

Tribe TIPULINI.

KEY TO GENERA.

1. Abdomen greatly elongated in both sexes, much longer than the wing; antennae very small; male hypopygium of simple structure, the pleural appendages lying in the dorsal cavity of the ninth sternopleurite--------2.
   Abdomen not greatly elongated in the male, very rarely so in the female (*Tipula longiventris*) male hypopygium otherwise--------------------3.
2. Cell M. sessile, wings strongly suffused with reddish-brown---------------- *Aeshnasoma* (p. 395).
   Cell M, short-petiolate; grayish, the subcostal cell brown--*Longurio* (p. 395).
3. *Rs* usually very short, almost transverse, simulating a crossvein; cell M_1 sessile or short-petiolate; basal deflection of Cu_1 or *m-cu* joining M at or before the fork; coloration usually yellow and black, shiny-------------- *Nephrotoma* (p. 395).
   Rs usually longer, not appearing like a crossvein; cell M_1 always petlolate; basal deflection of Cu_1 or *m-cu* joining *M* at its fork or, usually, underneath cell *first* M_2; coloration usually dull brown, yellow, or gray--------- *Tipula* (p. 398).

Genus LONGURIO Loew.

LONGURIO TESTACEUS Loew.

Virginia near Plummers Island, June 24, 1908, H. S. Barber; Cabin John Bridge, May 31, 1900 (pupal skin). This is the largest species of crane-fly in eastern North America, and in the female sex even exceeds the better known, *Holorusia rubiginosa* of the western States. The immature stages live in sandy soil along the margins of streams.

Genus AESHNASOMA Johnson.

AESHNASOMA RIVERTONENSIS Johnson.

Maywood, Virginia, July 10, 1919, at light, McAtee; previously known only from New Jersey.

Genus NEPHROTOMA Meigen.

KEY TO SPECIES.

1. Thoracic stripes black or blackish---------------------------------------2.
   Thoracic stripes, if present, brownish or reddish-----------------------3.
2. Antennal flagellum uniformly black; tip of wings and stigma darkened, the latter dark brown; velvety black marks at the ends of the V-shaped suture and the lateral praescutal stripes small, not close together; postnotum with a brown median line---------------------*N. incurva* (p. 397).
   Antennal flagellum with the basal segments bicolorous; tip of the wings not darkened; stigma pale brown; velvety black marks at the ends of the V-shaped suture very extensive, so the pale yellow lateral margin of the sclerite is restricted; postnotum yellow, unmarked-------------- *N. virescens* (p. 397).
3. Thoracic dorsum dull, opaque--4.
   Thoracic dorsum shiny; if at all opaque, the antennae of both sexes very short (*tenuis* group)---6.
4. Antennae of the male elongate, more than half the length of the body, the flagellum black----------------------------------*N. macrocera* (p. 397).
   Antennae short in both sexes, the flagellar segments indistinctly pale at base--5.

5. Male hypopygium incrassated, the ninth tergite very tumid, the two halves separated by a deep median longitudinal furrow---- *N. cornifera* (p. 396).
Male hypopygium small, not conspicuously incrassated-- *N. tenuis* (p. 397).
6. Antennal segments uniform in color---- 7.
Antennal segments bicolorous---- 16.
7. A velvety black spot at the ends of the lateral praescutal stripe---- 8.
No such spot---- 9.
8. Occiput with a narrow brown median line---- *N. calinota* (p. 396).
Occiput without such a line---- *N. punctum* (p. 397).
9. Occiput opaque with a shining triangular median spot---- 10.
Occiput shining---- 13.
10. A black spot at the ends of the V-shaped suture---- *N. ferruginea* (p. 397).
No such spot---- 11.
11. Antennae entirely yellowish---- *N. festina* (p. 397).
Antennal flagellum dark brown or black---- 12.
12. Stigma pale, brownish yellow---- *N. occipitalis* (p. 397).
Stigma dark, blackish brown (Regional)---- *N. gracilicornis* (Loew).
13. Antennae yellowish---- *N. festina* (p. 397).
Antennal flagellum dark brown or black---- 14.
14. Head with a shining triangular spot---- *N. occipitalis* (p. 397).
Head unicolorous---- 15.
15. Head and thorax yellowish, almost opaque; color in life strongly greenish---- *N. tenuis* (p. 397).
Head orange except the lateral margins of the vertex; thorax shining---- *N. sodalis* (p. 397).
16. Segments of the flagellum dark brown or black at the base; antennae with 13 segments---- 17.
Segments of the flagellum yellow at the base; antennae with more than 13 segments---- 18.
17. Wings strongly tinged with yellow; thorax shiny reddish without distinct stripes; antennae of the male elongated, strongly bicolorous---- *N. xanthosigma* (p. 398).
Wings grayish, more yellowish basally; thorax with rusty gray pruinose stripes, the intermediate one with a narrow black median vitta; antennae short in both sexes, indistinctly bicolorous---- *N. calinota* (p. 396).
18. Stigma yellowish brown; wing apex not darkened---- *N. eucera* (p. 396).
Stigma dark brown wing apex distinctly infuscated-- *N. polymera* (p. 397).

The immature stages of the species of *Nephrotoma* are spent in earth, decaying wood, and moss.

* NEPHROTOMA CALINOTA Dietz.

Plummer's Island, June 8, 1913, A. Wetmore; July 14, 1907, A. K. Fisher.

* NEPHROTOMA CORNIFERA Dietz.

Four-mile Run, Virginia, July 24, 1915, Alexander.

* NEPHROTOMA EUCERA Loew.

Forest Glen, Maryland, May 31, 1914, F. Knab; Great Falls, Virginia, June 14, 1914, L. O. Jackson; Plummers Island, May 24, 1902, R. P. Currie; May 24, 1914, McAtee; June 9, 1914, R. C. Shannon; Falls Church, Virginia, July 14, 1913, F. Knab; Mount Vernon, Virginia, June 9, 1918, McAtee.

NEPHROTOMA FERRUGINEA Fabricius.

Common; extreme dates of collection, April 19 and October 17; in copula, April 28, May 25, August 6; specimens bred from pupae June 1 and July 28. P. I.

* NEPHROTOMA FESTINA Dietz.

Plummers Island, July 28, 1912, McAtee.

* NEPHROTOMA INCURVA Loew.

Scott's Run to Ball's Hill, Virginia, August 12, 1917, McAtee; Plummers Island, June 26, 1905, H. S. Barber; June 27, 1909; Maryland near Plummers Island, July 27, 1916, McAtee; Cabin John Bridge, Maryland, June 28, 1913, R. C. Shannon, July 29, 1916; Lakeland to Riverdale, Maryland, July 14, 1916, McAtee.

NEPHROTOMA MACROCERA Say.

Abundant; season May 16 to September 13. P. I.

NEPHROTOMA OCCIPITALIS Loew.

Plummers Island, August 24, 1907, McAtee.

NEPHROTOMA POLYMERA Loew.

Falls Church, Virginia, September 26, 1915; Virginia near Plummers Island, June 17, 1913, Plummers Island, June 2, 1916, June 17, 1913, McAtee; Glen Echo, Maryland, June 3, 1898, R. P. Currie; Forest Glen, Maryland, June 1, 1913, F. Knab.

NEPHROTOMA PUNCTUM Loew.

Plummers Island, June 17, 1906, McAtee; Maryland near Plummers Island, June 29, 1903, in copula, W. V. Warner.

NEPHROTOMA SODALIS Loew.

Plummers Island, July 7, 21, 28, August 25, 1912, McAtee; August 3, R. P. Currie; Washington, District of Columbia, June 13, 1909, McAtee.

NEPHROTOMA TENUIS Loew.

Falls Church, Virginia, July 13, 1913; Glencarlyn, Virginia, June 15, 1913, F. Knab; Virginia near Plummers Island, September 5, 1915, L. O. Jackson; Plummers Island, June 6, 1909; Beltsville, Maryland, September 30, 1917, McAtee.

* NEPHROTOMA VIRESCENS Loew.

Fairly common; season, May 30 to August 17; reared from moss, Plummers Island, April 5, 1913, R. C. Shannon; seen ovipositing, Mount Vernon, Virginia, July 13, 1917, McAtee.

NEPHROTOMA XANTHOSTIGMA Loew.

Great Falls, Virginia, August 15, 1915, McAtee; Falls Church, Virginia, May 25, Glencarlyn, Virginia, June 20, Banks; June 8, 1918, McAtee; Hyattsville, Maryland, August 14, 1912, F. Knab; Eastern Branch near Benning, District of Columbia, August 29, 1915; Odenton, Maryland, July 29, 1917, McAtee.

Genus TIPULA Linnaeus.

KEY TO SPECIES.[1]

1. Wings with a distinct pubescence in the apical cells---------- 2.

Wings entirely glabrous---------- 4.

2. Coloration bright shiny yellow, reddish and black; vertex shiny, with a black spot along the inner margin of each eye and a linear dark brown median area; thorax yellow with three shiny reddish stripes, the median one narrowly divided; male antennae very short, not attaining the wing base; pubescence of the wings confined to cell R_5. (Subgenus *Odontotipula* Alexander)---------- *T.* (*O.*) *unifasciata* (p. 403).

Coloration dull brown and yellow; vertex opaque without black marks; praescutum dull, dark colored with paler stripes; male antennae elongate, reaching about to the base of the abdomen; pubescence of the wings more extensive, including cells R_3 to M_2. (Subgenus *Cinctotipula* Alexander---------- 3.

3. Antennal flagellum bicolorous; abdomen without distinct crossbands---------- *T.* (*C.*) *unimaculata* (p. 403).

Antennal flagellum unicolorous; abdomen with the posterior half of each segment brown, the basal half more yellowish, producing a banded appearance---------- *T.* (*C.*) *algonquin* (p. 403).

4. Coloration as in the genus *Nephrotoma*, shiny, contrasting yellows and blacks---------- 5.

Coloration dull brown, gray, yellow, or blackish, not at all shiny---------- 6.

5. Head orange yellow, the occiput with a grayish black spot; praescutum orange yellow with three dull gray-black stripes; posterior half of the postnotum and the apical half of the first abdominal segment light gray---------- *T. collaris* (p. 404).

Head orange yellow, with a large brownish orange spot on each side of the vertex touching the inner margin of the eye; praescutum shiny, light honey yellow, with three shiny jet-black or reddish-black stripes; posterior margin of the postnotum and the apical half of the first abdominal segment not gray. (Regional)---------- *T. nobilis* (Loew).

6. Wings striped or streaked longitudinally with brown or reddish brown, this including the costal region and along *Cu;* cell *M* usually hyaline or nearly so; male hypopygium with the sclerites of the ninth segment fused into a continuous ring (*tricolor* group)---------- 7.

Wings not striped or streaked as above, the costal margin darkened in some cases, but if so with no brown seams on the other veins---------- 13.

7. Wings with cell R_5 hyaline or nearly so, at least on its apical half, thus being continuous or nearly so with the area in cell *M*---------- 8.

Wings with cell R_5 infuscated, concolorous with cells R_3 and M_1---------- 11.

8. Large species, wing of the male over 20 mm.; base of cell R_5 darkened---------- 9.

Smaller species, wing of the male under 18 mm.; cell R_5 hyaline---------- 10.

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[1] No especial effort has been made in this paper to separate the females of this difficult and complex genus.

9. Large species, wing of male over 20 mm-------------------------------*9a.*

Smaller, wing of male under 20 mm.; antennae longer, bicolorous; praescutal stripes not distinctly margined with darker; wing pattern very pale, the whitish including almost all of cell *M* and all except the tips of cells M_1. M_2, and M_3; abdomen with the lateral stripes less distinct------------ *T. strepens* (p. 406).

9a. Antennal flagellum shorter, unicolorous dark brown; wings dark brown with cell 1st M. and the apical two-thirds of R_5 hyaline; the brown marking covers cells M_1 and M_2 Cu_1, and all but the extreme base of M_3; ninth tergite of male hypopygium with a powerful, slightly curved, claw-like horn on either side of the median lob---------*T. noveboracensis* (p. 406).

Antennal flagellum longer, indistinctly bicolorous; wings dark brown, with the hyaline areas including the basal half of cell *first* M_2, the bases of cells M_1, *second* M_2, and M_3, and the apical half of R_5; ninth tergite of male hypopygium without such horns subtending the median lobe------- *T. caloptera* (p. 404).

10. Antennae short, with only the basal segments of the flagellum distinctly bicolorous; wing pattern more clear cut, the costal stripe broader and darker brown, vein *Cu* and the basal deflection of Cu_1 with a broad, dark brown seam---*T. bella* (p. 404).

Antennae longer, with all except the terminal segments of the flagellum distinctly bicolorous; wing pattern less distinct and rather poorly defined, the brown seams and stripes much paler---------------*T. eluta* (p. 404).

11. Wing pattern clear cut, the milky white obliterative streak proximad of the cord passes beyond cell *first* M_2 and almost reaches the posterior margin of the wing; male hypopygium without a pencil of setae on either side of the ninth tergite----------------------------------*T. fraterna* (p. 404).

Wing pattern more diffuse, the white obliterative streak ending in the extreme base of cell M_3--12.

12. Coloration gray, the thoracic stripes darker; male hypopygium with a pencil of reddish setae on either side of the ninth tergite----*T. tricolor* (p. 407).

Coloration reddish brown, the thoracic stripes reddish; male hypopygium without such a pencil of setae------------------*T. sackeniana* (p. 406).

13. Costal margin of the wings dark brown; male hypopygium with the sclerites of the ninth segment fused into a continuous ring---------------------12.

Costal margin of the wings not dark brown-----------------------------15.

14. Wings with the brown costal margin including the base and the anterior parts of cells *R* and R_1; male hypopygium having the ninth tergite with a broad depressed median lobe------------------------*T. sayi* (p. 406).

Wings with the brown costal margin including cells *C* and *Sc* only; male hypopygium having the ninth tergite with a medium notch-------------- *T. cunctans* (p. 404).

15. Wings strongly tinged with yellow; a brownish cloud at the end of vein *second A;* male hypopygium with the sclerites of the ninth segment fused into a continuous ring and the tergal region notched medially----------- *T. ultima* (p. 407).

Wings without a strong yellowish tinge; if suffused with yellowish, no brown cloud at end of vein *second A*----------------------------------16.

16. Wings spotted, banded, clouded or tipped with brown or gray-----------17.

Wings unicolorous hyaline, yellowish or dark brown; in many cases, however, with the stigmal spot present; usually a pale, vitreous obliterative streak at or before the cord, extending from before the stigma to the region of cell *first* M_2 or beyond; in some cases the costal region is a little darkened, and perhaps a vitreous spot beyond the stigma in the base of cell R_2---29.

17. Wings banded brown and white, with a broad, uninterrupted white crossband beyond the stigma, extending from the end of cell *second* R_1 to the middle of cell M_3, or beyond to the wing margin; antennal flagellum unicolorous-------------------------------------*T. trivittata* (p. 407).

Wings without such an uninterrupted white crossband beyond the stigma---18.

18. Large, length of male over 25 mm.: vertex light yellow, thoracic dorsum with a velvety black pattern, margined with paler producing an ocellate appearance; abdominal tergites bright orange with a broad brownish black stripe on either side, segments 7 to 9 dark brownish black---------*T. abdominalis* (p. 403).

Smaller, length of male usually under 20 mm.; not colored as above----19.

19. Coloration bright orange, the thoracic dorsum without darker stripes; wings yellowish basally, more clouded with brown apically; male hypopygium assymetrical, the right pleurite produced caudad into a prominent two-cleft arm (male, *speciosa* Loew); the female is conspicuously different, the wings being dark brown, sparsely marked with white---------------*T. fuliginosa* (p. 405).

Coloration not as above--20.

20. Male hypopygium with the ninth tergite produced caudad into a compressed median lobe; antennae elongate, bicolorous; wings with an extensive brownish gray blotch before the cord, occupying the ends of cells *R* and *M* and the lower basal angle of cell Cu_1-------------*T. hermannia* (p. 405).

Male hypopygium not as above---21.

21. Wings with a pale gray tinge, more brownish in cell *M* along vein *Cu*; hyaline spots in the anal cells, at two-thirds the length of cell *M*, before the stigma, and an interrupted band before the cord extending to cell *first* M_2; body coloration gray, male hypopygium small, not conspicuously elongated or enlarged (*fragilis* group)-------------------------------22.

Wings brown or dark gray, with a pattern of white or hyaline spots and blotches --23.

22. Stripes on the praescutum ending at the level of the pseudosutural foveae, the intermediate pair blunt at their anterior ends; apical tergites of the abdomen not conspicuously darkened---------------*T. fragilis* (p. 404).

Intermediate stripes of the praescutum extending about to the anterior margin of the sclerite, each deeply bifid at its anterior end; apical tergites of the abdomen largely blackish-----------------*T. ignobilis* (p. 405).

23. Male hypopygium with the ninth tergite elongate-cylindrical, strongly upturned; eighth sternite with the posterior margin tripartite and clothed with yellow hairs; wings with a veriegated brown, gray, and white pattern (*hebes* group)---24.

Male hypopygium with the ninth segment not strongly upturned---------25.

24. Antennae of the male elongate, extending about to the base of the abdomen, bicolorous--*T. hebes* (p. 405).

Antennae short in both sexes, extending about to the wing root, yellowish brown--*T. grata* (p. 405).

25. Wings with the apex narrowly and irregularly darkened; narrow brown seams along the cord; antennae dark brown; praescutum gray with darker gray stripes, which are narrowly margined with dark brown; pleura clear light gray; ninth tergite of the male hypopygium with the posterior margin produced into two short, parallel lobes, one on either side of the median line---------------------------------*T. iroquois* (p. 405).

Wings not colored as above---26.

26. Wing apex infuscated; a dark spot at the origin of the sector; ninth tergite of the male hypopygium prominent, deeply notched, the lateral lobes acute ---------- 26*a*.

Not as above; if the wing-pattern is as described (*valida* group), the size is much larger (wing of male 20 mm.) ---------- 27.

26*a*. Ninth tergite with the lateral horns very long, tapering gradually to the acute tips; inner pleural appendage a narrow, flattened blade that runs out into a long acute point, the outer edge with a single, conspicuous ventral tooth; gonapophyses very long and delicate, sinuous -- *submaculata* (p. 406).

Ninth tergite with the lateral horns short to very short, tapering abruptly to the acute tips; inner pleural appendage a short, flattened blade with the apex truncated or rounded and without a conspicuous ventral tooth; gonapophyses stouter, not sinuous ---------- *mallochi* (p. 406).

27. Large, wing of male 20 mm.; wings with apices light or dark brownish gray; male hypopygium greatly enlarged. (*valida* group.) ---------- 28.

Smaller, wing of male under 18 mm.; wings with a heavy brown and white or gray and white pattern, female abdomen very long, the valves of the ovipositor serrated ---------- *T. longiventris* (p. 405).

28. Ninth tergite with the lateral lobes slender and produced; eighth sternite without a long brush of hairs; wing apex darker, brownish. (Regional.) *T. valida* Loew.

Ninth tergite with the lateral lobes shorter and less evident; eighth sternite with a tuft of long yellow hairs; wing apex light gray. (Regional.) *T. hirsuta* Doane.

29. Male light yellow, the thoracic stripes indistinct; antennae elongated, bicolorous; distal end of cell *1st* M_2 pointed; ninth tergite with a compressed median lobe; female conspicuously different, the body and wings brown; size very small, wing under 8 mm ------ *T. annulicornis* (p. 403).

Characters not as above ---------- 30.

30. Antennae bicolorous, the basal enlargement of each segment of the flagellum yellow, the rest black ---------- *T. tephrocephala* (p. 407).

Antennae not as above ---------- 31.

31. Sclerites of the ninth segment of the male hypopygium fused into a nearly complete ring; caudal margin of the tergite with a broad, depressed median lobe; antennae bicolorous; legs very long -- *T. perlongipes* (p. 406).

Sclerites of the ninth segment not fused, at least the tergite distinct; no such median projections on the tergite ---------- 32.

32. Ninth tergite large, the caudal margin with a small rounded notch on either side of a small, acute median tooth; eighth sternite with a broad, fleshy, lateral lobe on either side, directed proximal; median area of the sternite with a prominent chitinized tooth on either side of the median line; size large wing about 18 mm.; antennae bicolorous ---------- *T. umbrosa* (p. 407).

Ninth tergite not as described; eighth sternite, if with fleshy lobes (*australis*, *valida*) without two chitinized teeth on the median area -------- 33.

33. Size large (wing over 20 mm.); male hypopygium greatly enlarged; eighth sternite with elongate lateral lobes and a flattened median lobe. (*valida* group.) ---------- 34.

Size smaller, wing under 18 mm.; male hypopygium not greatly enlarged; eighth sternite not as above ---------- 35.

34. Ninth tergite with the lateral lobes slender; eighth sternite without a long brush of hairs. (Regional.) ---------- *T. valida* Loew.

Ninth tergite with the lateral lobes short and blunt; eighth tergite with a brush of long yellow hairs. (Regional.)--------------*T. hirsuta* Doane.

35. Wing apex a little grayer than the basal cells of the wings; a brown spot at the origin of the sector; male hypopygium with the ninth tergite large, deeply split by a broad V-shaped notch, the lateral lobes acutely pointed-- *T. submaculata* (p. 406).

Wing apex concolorous with the rest of the wing; ninth tergite otherwise--------------------------------36.

36. Ninth tergite with the median area produced caudad into two parallel or divergent horns or lobes; coloration grayish, the pleura light blue-gray; size small, wing of the male about 12 mm--------------------------37.

The combination of characters otherwise; size larger, wing of the male over 15 mm--------------------------------37.

37. Male hypopygium with the ninth tergite produced medially into two flattened divergent horns; outer pleural appendage elongate, conspicuous; inner pleural appendage short, broad--------------*T. dejecta* (p. 404).

Male hypopygium with the ninth tergite produced medially into two parallel lobes, the lateral angles of the sclerite produced caudad into blunt, minutely roughened lobes; outer pleural appendage inconspicuous, inner pleural appendage long, narrow-------------------*T. aprilina* (p. 403).

38. Coloration of the thoracic pleura light gray; thoracic dorsum gray or grayish, with brown stripes--------------------------------39.

Coloration of the thoracic pleura yellow, in some cases whitish pollinose; dorsum yellow or brown--------------------------------40.

39. Antennae short, the flagellar segments deeply constricted beyond the basal enlargement; six brown stripes on the mesonotal praescutum; male hypopygium with the eighth sternite with four conspicuous lobes, an outer broad and flattened pair, the inner pair median in position-------- *T. australis* (p. 403).

Antennae longer, the flagellar segments not constricted beyond the basal enlargement; three brown stripes on the mesonotal praescutum; male hypopygium without lobes on the eighth sternite---*T. dietziana* (p. 404).

40. Nasus short; cell *1st* M_2 of the wings very small and pentagonal; male hypopygium with the ninth tergite tumid, unarmed or provided with horns (*bicornis* group)--------------------------------41.

Nasus usually longer; cell *1st* M_2 of the wings not small and pentagonal; male hypopygium with the ninth tergite not tumid (*translucida* group)-43.

41. No horns on the ninth tergite-------------------*T. johnsoniana* (p. 405).

Ninth tergite armed with horns--------------------------------41.

42. Horns on the ninth tergite directed upward, or dorsad--*T. bicornis* (p. 404).

Horns on the ninth tergite directed laterad or slightly ventrad------------ *T. morrisoni* (p. 406).

43. Caudal margin of the ninth tergite with three prominent lobes, the median lobe acute; antennae bicolorous; body coloration light yellow, the thoracic stripes reddish brown; abdomen with a series of about four conspicuous, rounded brown spots along the sides---------------*T. triton* (p. 407).

Caudal margin of the ninth tergite not conspicuously trifid--------------44.

44. Caudal margin of the ninth tergite deeply notched, the lateral lobes produced into long, slightly curved horns; antennae bicolorous; body coloration yellowish, the thoracic stripes very indistinct; wings yellowish---- *T. tuscarora* (p. 407).

Male hypopygium otherwise--------------------------------45.

45. Caudal margin of the ninth tergite with a small median notch, the lateral lobes very broad and squarely truncated; antennae more or less distinctly bicolorous; coloration brownish yellow--------------*T. mingwe* (p. 406).
Male hypopygium otherwise--46.
46. Lateral lobes of the ninth tergite of the male hypopygium pointed, close together--*T. translucida* (p. 406).
Lateral lobes of the ninth tergite bluntly rounded at their apices, the median area broad, highly convex to obtusely pointed-----*T. georgiana* (p. 405).

The immature stages of species of the genus *Tipula* are spent in a variety of habitats. Some are practically aquatic (*T. abdominalis* and others), others live in dry garden soil (*T. bicornis*, *T. umbrosa* and others), and still other species live in decaying wood. A large number of the local species live in wet moss cushions.

Subgenus CINCTOTIPULA Alexander.

* TIPULA ALGONQUIN Alexander.

Virginia, near Plummers Island, July 28, 1912, F. Knab; Plummers Island, August 4, 1907, McAtee.

TIPULA UNIMACULATA Loew.

Plummers Island, July 5, 1912, in copula, E. A. Schwarz and H. S. Barber; July 21, 1915, McAtee; July 25, 1915, Alexander and McAtee; Rosslyn, Virginia, July 11, 1913, R. C. Shannon.

Subgenus ODONTOTIPULA.

* TIPULA UNIFASCIATA Loew.

Falls Church, Virginia, September 26, 1916, McAtee.

Subgenus TIPULA Linnaeus.

TIPULA ABDOMINALIS Say.

Frequent: August 8 to October 14, is attracted to light. P. I.

TIPULA ANNULICORNIS Say.

Maryland, near Plummers Island, August 2, 1914, McAtee; Beltsville, Maryland, July 6, Nathan Banks; August 8, 1915, McAtee.

* TIPULA APRILINA Alexander.

Great Falls, Virginia, May 2, 1917; Mount Vernon, Virginia, April 16, 1916; April 28, 1918; Beltsville, Maryland, May 13, 1917, McAtee.

TIPULA AUSTRALIS Doane.

Great Falls, Virginia, April 20, 1916; May 2, 1916; Plummers Island, April 28, 1915, McAtee; Maryland, near Plummers Island, April 20, 1916, L. O. Jackson; Beltsville, Maryland, April 30, 1916, McAtee; Washington, District of Columbia, Osten Sacken.

* TIPULA BELLA Loew.

Abundant; extreme dates of collection, April 15 and September 29; in copula, April 15, 18, May 2; is attracted to light. P. I.

TIPULA BICORNIS Forbes.

Forest Glen, Maryland, May 21, 26, 1914, at light, O. Heidemann; College Park, Maryland, May 25, 1913, F. Knab; Four-mile Run, Virginia, May 31, 1914, McAtee.

TIPULA CALOPTERA Loew.

Pimmit Run, Virginia, September 6, 1908, F. Knab; Plummers Island, June 8, 1913, McAtee; Cabin John Bridge, Maryland. May 20, 1903, W. V. Warner.

TIPULA COLLARIS Say.

Locally common in springy places during its rather short season, April 8 to 28; in copula, April 18. V. P. I.

TIPULA CUNCTANS Say.

An autumnal species; Ingleside, Virginia, October 14, 1917, Dead Run, Virginia, October 28, 1919, McAtee; Falls Church, Virginia, October 19, Banks; Rosslyn, Virginia, October 6, 1912, F. Knab; Plummers Island, October 9, 1906, McAtee; October 13, 1906, A. K. Fisher; Eastern Branch, District of Columbia, October 22, 1914, R. C. Shannon.

TIPULA DEJECTA Walker.

Another species that has been taken only in April, 6 to 25; in copula, 16; various localities in Virginia, and Plummers Island.

* TIPULA DIETZIANA Alexander.

Numerous in its season; April 2 to May 2; in copula, April 20 and 25; has been taken on plum flowers. P. I.

* TIPULA ELUTA Loew.

Frequent; dates of capture range from April 25 (in copula) to August 29. P. I.

* TIPULA FRAGILIS Loew.

The type specimen, a female, of *Tipula suspecta*, Loew, from the District of Columbia apparently is a *T. fragilis*, although possibly *T. ignobilis* Loew.

* TIPULA FRATERNA Loew.

Scotts Run, Virginia, July 25, 1915, Alexander and McAtee; Four-mile Run, Virginia, May 31, 1914, McAtee.

TIPULA FULIGINOSA Say.

The remarkable difference in coloration of the sexes of this species resulted in the male being described by Loew under the name of *T. speciosa*, and the two sexes being regarded as distinct species for many years. The identity of the two forms was indicated when two pupae collected by Messrs. Barber and Shannon, in débris beneath the nest of a turkey vulture, on Jacksons Island, Maryland, May 23, 1913, were bred and one produced a male *speciosa*, the other a female *fuliginosa*. A pair, in copula, collected near Cabin John Bridge, Maryland, June 10, 1917, by R. M. Fouts settled the identity of these forms. The species is fairly common, and dates of collection range from May 28 to June 30. P. I.

TIPULA GEORGIANA Alexander.

Beltsville, Maryland, May 24, 1917, McAtee.

* TIPULA GRATA Loew.

The lectotype was collected in the District of Columbia by Osten Sacken.

TIPULA HEBES Loew.

Frequent; season August 1 to September 7. P. I.

TIPULA HERMANNIA Alexander.

Cabin John Bridge, Maryland, June 9, September 14, 1915, R. C. Shannon; Oxon Run, Maryland, September 6, 1915; Beltsville, Maryland, September 3, 1916, McAtee.

* TIPULA IGNOBILIS Loew.

The lectotype was collected in the District of Columbia by Osten Sacken.

TIPULA IROQUOIS Alexander.

Great Falls, Virginia, April 20, 1913, C. P. Heinrich.

TIPULA JOHNSONIANA Alexander.

Plummers Island, Maryland, June 7, 13, 1914; Maryland near Plummers Island, June 2, 1916, McAtee.

TIPULA LONGIVENTRIS Loew.

Plummers Island, May 29, 1919, H. L. Viereck, June 8, 1914, E. A. Schwarz and H. S. Barber; Dead Run, Virginia, June 6, 1914, R. C. Shannon; Glencarlyn, Virginia, June 1, 1918, Mount Vernon, Virginia, June 4, 1916, McAtee; Washington, District of Columbia, May 18, 1903, W. V. Warner.

* TIPULA MALLOCHI Alexander.

Cabin John Run, Maryland, June 13, 1910, W. T. Davis.

* TIPULA MINGWE Alexander.

Common; season May 12 to August 28; is attracted to light. All specimens so far collected are from the Piedmont Plateau. P. I.

TIPULA MORRISONI Alexander.

Maryland near Plummers Island, May 24, 1914; Virginia near Plummers Island, June 2, 1916, June 2, 1918, Four-mile Run, Virginia, May 31, 1914; Mount Vernon, Virginia, June 4, 1916, Glencarlyn, Virginia, June 1, 1919, McAtee; Fort Washington, Maryland, May 26, 1896, C. W. Johnson.

TIPULA NOVEBORACENSIS Alexander.

Virginia near Plummers Island, April 20, 1919, McAtee.

TIPULA PERLONGIPES Johnson.

Great Falls, Virginia, July 21, 1919, McAtee; Falls Church, Virginia, June 21 1914, July 4, 1913, F. Knab; Rives, Maryland, June 14, 1916; in copula, L. O. Jackson: Beltsville, Maryland, June 16, 1912, McAtee.

* TIPULA SACKENIANA Alexander.

Difficult Run, Virginia, July 25, 1915, Alexander and McAtee; Falls Church, Virginia, September 26, 1915, Beltsville, Maryland, July 30, 1916, August 6, 1916, August 8, 1915; Odenton, Maryland, July 29, 1917, McAtee.

TIPULA SAYI Alexander.

Common; season August 17 to October 8; in copula, September 25. V. P. I.

TIPULA STREPENS Loew.

Great Falls, Virginia, May 23, 1918, McAtee; Bladensburg, Maryland, June 4, 1916, L. O. Jackson; Beltsville, Maryland, May 28, 1916, McAtee.

TIPULA SUBMACULATA Loew.

Common; dates of collection range from May 24 to July 4. All records from the Piedmont Plateau. P. I.

TIPULA TRANSLUCIDA Doane.

Plummers Island, June 19, 1913, at light, R. C. Shannon.

TIPULA TEPHROCEPHALA Loew.

Mount Vernon, Virginia, June 9, 1918, McAtee.

TIPULA TRICOLOR Fabricius.

Frequent; season from July 20 to September 6. P. I.

* TIPULA TRITON Alexander.

District of Columbia, Osten Sacken.

TIPULA TRIVITTATA Say.

Jacksons Island, May 22, 1913, at trap light, R. C. Shannon and H. S. Barber; Plummers Island, May 31, 1908, June 23, 1907, McAtee; Washington, District of Columbia, June 6, 1913, R. C. Shannon; Beltsville, Maryland, May 28, 1916, McAtee.

* TIPULA TUSCARORA Alexander.

Glencaryln, Virginia, June 21, F. Knab; Washington, District of Columbia, no date.

TIPULA ULTIMA Alexander.

Common in autumn, September 5 to October 30, emerging in numbers on latter date, however, and frequent in copula; comes to light. V. P. I.

TIPULA UMBROSA Loew.

Frequent, May 18 to July 13.

Tribe LIMNOBIINI.

KEY TO GENERA.

1. Rostrum elongated, longer than the head and thorax taken together________ *Geranomyia* (p. 408.)
   Rostrum not elongated, shorter than the head_____________________________2.
2. A supernumerary crossvein in cell *first A*, connecting the two anal veins_____ *Discobola* (p. 408).
   No supernumerary crossvein in cell *first A*________________________________3.
3. Often with a supernumerary crossvein in cell *Sc;* antennae of the male bi-uni-, or sub-pectinate__________________________________*Rhipidia* (p. 409).
   No supernumerary crossvein in cell *Sc* (excepting a weak one in *Dicranomyia simulans*); antennae of the male not pectinate_______________________4.
4. *Sc* usually short, ending opposite the origin of *Rs;* claws with usually but a single tooth on the lower side; ventral pleural appendage of the male hypopygium a fleshy lobe_________________________*Dicranomyia* (p. 410).
   Sc always elongate, ending far beyond the origin of the sector; *r* often considerably removed from the tip of *R*; claws with usually two or three teeth on the lower side; ventral pleural appendage of the male hypopygium horny____*Limnobia* (p. 412).

Genus GERANOMYIA Haliday.

KEY TO SPECIES.

1. Wings heavily spotted with dark brown; tips of the tibiae black............ *G. rostrata* (p. 408).
   Wings unmarked or with only pale indistinct seams along the cord.......2.
2. *Sc* short, ending opposite or just beyond the origin of *Rs;* crossveins and deflections of veins faintly seamed with darker. (Regional.)............ *G. diversa* Osten Sacken.
   Sc long, ending at about midlength of *Rs;* wings unmarked except for the stigma spot ....3.
3. Body coloration yellow; wings with the stigma pale; legs dull yellow, the femora not darkened at their tips....................*G. distincta* (p. 408).
   Body coloration yellowish brown, darkest on the scutal lobes and the postnotum; wings with the stigma oval, dark brown, well defined; legs brownish yellow, the femora brown at the tips....*G. canadensis* (p. 408).

The adult flies of this genus feed on various flowers, especially the Compositae and Umbelliferae. The immature stages were until very recently quite unknown. In 1918 Mr. J. R. Malloch found the larvae and pupae at Urbana, Illinois. The larvae are acquatic with habits very similar to *Dicranomyia simulans*, living in silt-covered tubes on the exposed faces of rocks over which a thin sheet of water pours continuously.

GERANOMYIA CANADENSIS Westwood.

Plate 23, fig. 2.

Common; dates of collection range from May 2 to October 26; found upon flowers of *Aster*, *Solidago*, *Verbesina alternifolia* and *Eupatorium ageratoides*. P. I.

GERANOMYIA DISTINCTA Doane.

Beltsville, Maryland, June 20, 1910, June 23, 1918, McAtee.

GERANOMYIA ROSTRATA Say.

Frequent; season May 1 to October 7, known to visit flowers of *Verbesina* and *Eupatorium*. P. I.

Genus DISCOBOLA Osten Sacken.

The immature stages of members of this genus live beneath the bark of trees, especially of conifers.

DISCOBOLA ARGUS Say.

Dead Run, Virginia, May 23, 1915, R. C. Shannon; Virginia near Plummers Island, October 28, 1905, H. S. Barber; Rosslyn, Virginia, October 6, 1912, F. Knab; Plummers Island, July 21, 1912, McAtee; Washington, District of Columbia, August 28, Nathan Banks.

Genus RHIPIDIA Meigen.

KEY TO SPECIES.

1. Wings with an abundant pale brown or gray dotting in all the cells ______ 2.
   Wings with the markings larger and confined to the vicinity of the veins __ 3.
2. Body coloration grayish, the praescutum with a broad black median line; postnotum gray; wings with a heavy brown pattern along the costal margin, these marks about equal in extent to the interspaces; legs brown; male antennae bipectinate ______ *R. maculata* (p. 409).
   Body coloration yellowish brown, the praescutum without a broad black median line; postnotum black; wings with small black spots at the base, on the subcostal crossvein, origin of the sector and the stigma, these marks much smaller than the interspaces; legs yellow; male antennae subpectinate ______ *R. shannoni* (p. 410).
3. Praescutum reddish brown with narrow black lines; pleura dull yellow with two narrow blackish longitudinal stripes; antennae with segments 12 and 13 light yellowish; basal deflection of *Cu* usually far before the fork of *M;* antennae of the male subpectinate ______ *R. domestica* (p. 409).
   Praescutum gray with a broad black median line; pleura grayish or plumbeous, unstriped; antennae black throughout; basal deflection of Cu_1 at the fork of *M;* antennae of the male not subpectinate ______ 4.
4. Wings with the dark pattern beyond the origin of the sector only, a large rounded cloud at the origin and the fork of the sector, the large rectangular stigmal blotch and the radial cells largely darkened; abdomen dark brown, the genitalia reddish yellow; antennae of the male unipectinate ______ *R. fidelis* (p. 409).
   Wings with a series of about five large grayish brown blotches along the costal margin, two being before the origin of the sector; abdominal tergites yellow, the posterior half of each segment dark brown; antennae of the male bipectinate ______ *R. bryanti* (p. 409).

The immature stages are spent beneath the bark of trees (*R. bryanti*, *R. fidelis*) or in decaying animal or vegetable matter.

RHIPIDIA BRYANTI Johnson.

Plummers Island, September 4, 1904, E. A. Schwarz and H. S. Barber; Washington, District of Columbia, adult emerged May 18 from pupa collected May 11, 1913, by R. C. Shannon.

* RHIPIDIA DOMESTICA Osten Sacken.

Common; dates of collection range from February 17 to October 28; is often attracted to light. P. I.

RHIPIDIA FIDELIS Osten Sacken.

Washington, District of Columbia, August 28, 1882.

RHIPIDIA MACULATA Meigen.

Frequent; season, July 26 to October 27; comes to light. P. I.

* RHIPIDIA SHANNONI Alexander.

Great Falls, Virginia, October 21, Nathan Banks; Dead Run, Virginia, October 28, 1919, McAtee; Plummers Island, May 19, 26, 1914, at light, June 14, 1913, July 4, 1913, R. C. Shannon; July 21, September 5, October 22, 1915, September 13, 1914, McAtee; August 8, 18, 1912, J. R. Malloch; Cabin John, Maryland, August 30, F. Knab.

Genus DICRANOMYIA Stephens.

KEY TO SPECIES.

1. Wings very long and narrow, lanceolate__________*D. longipennis* (p. 412).
   Wings broad, not lanceolate__________2.
2. *Sc* ending opposite, or before, or but slightly beyond the origin of the sector__________3.
   Sc ending far beyond the origin of the sector__________13.
3. Antennae with at least the basal segments pale__________4.
   Antennae with the segments dark throughout__________7.
4. Cell *first* M_2 open, the *m* cross-vein lacking__________6.
   Cell *first* M_2 closed__________5.
5. Flagellum of the antenna and the halteres pale__________*D. pudica* (p. 412).
   Flagellum of the antenna and the halteres brown__________*D. diversa* (p. 411).
6. Praescutum with a single brown stripe; dorsal pleural appendage of the male hypopygium a short hook__________*D. immodesta* (p. 412).
   Praescutum with three brown stripes; dorsal pleural appendage of the male hypopygium a strong, saberlike hook which touches its mate of the opposite side__________*D. gladiator* (p. 411).
7. Cell *first* M_2 open; *Sc* far before the origin of *Rs* due to the shortness of the latter, which is about equal to the basal deflection of R_{4+5}__________*D. brevivena* (p. 411).
   Cell *first* M_2 closed; *Sc* nearly opposite the origin of *Rs*, which is much longer than the basal deflection of R_{4+5}__________8.
8. Thorax shining black, the pleura with a grayish pruinosity__________*D. morioides* (p. 412).
   Thorax not shining black; gray, brown, or yellowish brown__________9.
9. Femora brown with the tips broadly yellow; wings marked with brown along the veins__________*D. badia* (p. 411).
   Femora not banded with yellow; wings unmarked or nearly so__________10.
10. Sc_1 much longer than Sc_2, being nearly, if not quite, the length of the stigma__________*D. distans* (p. 411).
    Sc_1 short, not more than one-half the length of the stigma__________11.
11. Coloration gray, the praescutum with a broad median brown stripe; a narrow brown seam on *r*__________*D. liberta* (p. 412).
    Coloration brown or yellowish brown; no narrow brown seam on *r*__________12.
12. The basal deflection of M_{1+2}, forming the inner end of cell *first* M_2, is arcuated so that cells *first* M_2 and R_3 are almost on a line__________*D. stulta* (p. 412).
    The basal deflection of M_{1+2} is not conspicuously arcuated, cell *first* M_2 being conspicuously more distant from the wing base than cell R_3__________*D. haeretica* (p. 412).
13. Wings spotted with darker__________14.
    Wings unmarked, except for the stigmal spot when present__________15.

14. Wings with brown dots in all the cells; femora with a yellowish ring before the tip---*D. simulans* (p. 412).
Wings with three large brown spots along the costa, the first at the origin of *Rs*, the second at the tip of *Sc*, the third at the tip of R_1; wings grayish brown, paler near the stigma; cord and outer end of cell *first* M_2 seamed with dark brown; femora without a yellowish ring before the tip-------*D. rara* (p. 412).

15. Wings with a distinct pubescence on the apical cells-*D. pubipennis* (p. 412).
Wings glabrous throughout--16.

16. No stigmal spot, nor brown seams to the veins; R_1 curved strongly toward R_{2+3} at the tip; tarsi brown--------------------*D. globithorax* (p. 411).
Stigma evident, dark brown; paler brown seams to the cord and the outer end of cell *first* M_2; R_1 not incurved toward R_{2+3}; tarsi whitish----------*D. macateci* (p. 412).

The immature stages are spent beneath decaying bark (*D. macateei*, *D. rara*), in moss cushions, or in water (*D. simulans*).

DICRANOYMIA BADIA Walker.

Common about springs and small streams; dates of collection range from February 21 to October 28; in copula, March 17, April 12. V. P. I.

* DICRANOYMIA BREVIVENA Osten Sacken.

Washington, District of Columbia, October 14, 1906, McAtee.

DICRANOYMIA DISTANS Osten Sacken.

Great Falls, Virginia, October 21, Nathan Banks: Dead Run, Virginia, April 20, 1913; Maywood, Virginia, October 16, 1915, at light, McAtee; Rosslyn, Virginia, October 6, 1912, F. Knab; Plummers Island, August 5, 1913, R. C. Shannon; November 24, 1901, H. S. Barber; Washington, District of Columbia, August 15, 1907, McAtee; Falls Church, Virginia, June 16, Nathan Banks.

* DICRANOYMIA DIVERSA Osten Sacken.

Washington, District of Columbia, April 15, August 15, September 9, 1907, McAtee.

DICRANOYMIA FLORIDANA Osten Sacken.

Washington, District of Columbia, November 30, 1907; Plummers Island, November 17, 1907, McAtee.

* DICRANOYMIA GLADIATOR Osten Sacken.

Beltsville, Maryland, October 7, 1917, McAtee.

* DICRANOYMIA GLOBITHORAX Osten Sacken.

Bellview to Difficult Run, Virginia, October 3, 1915, Virginia near Plummers Island, September 29, 1915, McAtee; Rosslyn, Virginia, July 7, 1912, F. Knab.

DICRANOYMIA HAERAETICA Osten Sacken.

Glencarlyn, Virginia, June 4, 11, 1911, F. Knab.

* DICRANOYMIA IMMODESTA Osten Sacken.

Common; season May 1 to October 25; comes to light. P. I.

* DICRANOYMIA LIBERTA Osten Sacken.

Very common; dates of collection range from April 22 to October 25; is frequently attracted to light. P. I.

DICRANOYMIA LONGIPENNIS Schummel.

Beltsville, Maryland, October 22, 1915, McAtee.

* DICRANOYMIA MACATEEI Alexander.

Great Falls, Va., August 11, 1915, October 3, 1915; Dead Run, Virginia, May 10, 1916, July 14, 1915; Plummers Island, Maryland, May 24, 1914, McAtee.

DICRANOYMIA MORIOIDES Osten Sacken.

Dead Run, Virginia, May 21, 1914, R. C. Shannon; Cabin John Bridge, Maryland, May 16, 1909, F. Knab.

* DICRANOYMIA PUBIPENNIS Osten Sacken.

Common along streams; season, April 20 to October 3. V. P. I.

DICRANOYMIA PUDICA Osten Sacken.

Falls Church, Virginia, May 21, N. Banks.

DICRANOYMIA RARA Osten Sacken.

Common; season May 23 to October 23; bred from rotten willow, Plummers Island, June 15, 1914, H. S. Barber.

DICRANOYMIA SIMULANS Walker.

Common along Piedmont streams, May 5 to November 23. P. I.

DICRANOYMIA STULTA Osten Sacken.

Glencarlyn, Virginia, June 17, 1917, Laurel, Maryland, May 30, 1919, McAtee.

Genus LIMNOBIA Meigen.

KEY TO SPECIES.

1. Cross vein *r* at the tip of R_1-- 2.
   Cross vein *r* removed from the tip of R_1-------------------------------- 5.
2. Knobs of the halteres black-- 3.
   Knobs of the halteres pale at the tips---------------------------------- 4.
3. Femora yellow, the extreme tips narrowly dark brown; wings yellowish with three eye-like markings--------------------------*L. triocellata* (p. 413).
   Femora with a brown band before the dark tips; pattern of the wings not ocellate; a row of small dark brown spots in cell *R*--*L. fallax* (p. 413).

4. Femora with three brown bands ------ *L. immatura* (p. 413).
   Femora with two brown bands ------ *L. cinctipes* (p. 413).
5. Wings with conspicuous brown clouds and seams ------ *L. indigena* (p. 413).
   Wings almost clear, only three or four tiny brown dots along the costal margin ------ *L. tristigma* (p. 413).

The immature stages are fungicolous (*L. triocellata*), mud inhabitants (*L. fallax*, and others), live in decaying vegetable matter (*L. indigena*) or in decaying wood.

LIMNOBIA CINCTIPES Say.

Great Falls, Virginia, April 20, 1916, October 3, 1915, McAtee: Plummers Island, August 13, 1912, October 10, 1904, E. A. Schwarz and H. S. Barber; Washington, District of Columbia, Osten Sacken.

LIMNOBIA FALLAX Johnson.

Glencarlyn, Virginia, July 11, Nathan Banks.

* LIMNOBIA IMMATURA Osten Sacken.

Great Falls, Virginia, October 4, 1916, McAtee; Plummers Island, May 14, 1914, at light, R. C. Shannon; June 30, 1912, McAtee; Maryland near Plummers Island, August 5, 1914, R. C. Shannon; Maywood, Virginia, October 22, 1915, McAtee.

* LIMNOBIA INDIGENA Osten Sacken.

Falls Church, Virginia, May 24, Nathan Banks; June 7, 1914, R. C. Shannon; July 7, 1912, Nathan Banks; Spring Hill, Virginia, September 21, 1911, F. Knab; Forest Glen, Maryland, May 30, 1914, McAtee.

* LIMNOBIA TRIOCELLATA Osten Sacken.

Abundant; extreme dates of collection, May 28 and October 29; reared from mushrooms, among which are *Clytocybe* species and *Boletus felleus*. P. I.

LIMNOBIA TRISTIGMA Osten Sacken.

Dead Run, Virginia, June 29, 1915, R. C. Shannon.

Tribe ANTOCHINI.

KEY TO GENERA.

1. Rostrum elongated, at least as long as the head ------ 2.
   Rostrum shorter than the head ------ 4.
2. Rostrum about as long as the head or a very little longer ------ *Rhamphidia* (p. 414).
   Rostrum about as long as the body ------ 3.
3. *Rs* with two branches reaching the wing margin ------ *Elephantomyia* (p. 414).
   Rs reaching the wing margin unbranched ------ *Toxorhina* (p. 414).
4. Crossvein *r* lacking ------ *Atarba* (p. 415).
   Crossvein *r* present ------ 5

5. Anal angle of the wing prominent, almost square; *Rs* very elongate, straight; basal deflection of Cu_1 before the fork of *M*_____________*Antocha* (p. 415).
   Anal angle of the wing feeble; *Rs* shorter, more arcuated; basal deflection of Cu_1 at or beyond fork of *M*____6.
6. R_1 beyond the tip of *Sc* long, longer than the sector alone; veins issuing from cell *first* M_2 very long______________________________*Dicranoptycha* (p. 415).
   R_1 beyond the tip of *Sc* short, less than the length of the sector alone; veins issuing from cell *first* M_2 alone______________________*Teucholabis* (p. 416).

Genus RHAMPHIDIA Meigen.

KEY TO SPECIES.

1. Rostrum short; legs yellow, the tips of the femora and the tibiae black; wings tipped with dusky______________________________*R. flavipes* (p. 414).
   Rostrum long; legs uniformly dark brown; wings uniformly subhyaline, not tipped with dusky___________________________________*R. mainensis* (p. 414).

The larvae of these species are semiaquatic in their habits.

RHAMPHIDIA FLAVIPES Macquart.

Plate 23, fig. 3.

Frequent; season May 19 to August 29; often attracted to light. P. I.

* RHAMPHIDIA MAINENSIS Alexander.

Hyattsville, Maryland, September 1, 1912, J. R. Malloch.

Genus ELEPHANTOMYIA Osten Sacken.

ELEPHANTOMYIA WESTWOODI Osten Sacken.

Several records from Piedmont localities; June 5 to August 23. The curious golden-yellow larva lives beneath the damp bark of fallen trees; here the fly has been bred from a rotten willow log. P. I.

Genus TOXORHINA Loew.

KEY TO SPECIES.

1. Cell *first* M_2 closed; body coloration brownish yellow; size larger, wing about 6.5 mm. (Regional.) ___________. _______________*T. magna* Osten Sacken.
2. Cell *first* M_2 open by the atrophy of *m* (closed in abnormal specimens only); body coloration gray; size smaller, wing less than 5.5 mm________________ *T. muliebris* (p. 414).

TOXORHINA MULIEBRIS Osten Sacken.

The adult is usually found on flowers; Beltsville, Maryland, June 14, 1914; July 9, 1916; August 8, 1913, common on flowers of *Clethra alnifolia;* August 15, 1909, on flowers of *Solidago canadensis* (the last specimens recorded by Knab as *Geranomyia diversa*). McAtee; Great Falls, Virginia, on flowers of *Ceanothus*, Nathan Banks; Glencarlyn to mouth of Four-mile Run. Virginia. on flowers of *Apocynum medium*, June 11. 1916, McAtee.

Genus ATARBA Osten Sacken.

ATARBA PICTICORNIS Osten Sacken.

Common; season May 16 to August 9; in copula, June 24; is attracted to light; the immature stages are unknown. P. I.

Genus ANTOCHA Osten Sacken.

* ANTOCHA SAXICOLA Osten Sacken.

Abundant; dates of collection range from April 20 to September 24; in copula, April 23, May 4; is attracted to light; the immature stages are strictly aquatic. P. I.

Genus DICRANOPTYCHA Osten Sacken.

KEY TO SPECIES.

1. Wings with a strong reddish-brown or fulvous tinge; *Rs* notably longer than cell *first* M_2. (Regional.)____________________*D. germana* Osten Sacken.
   Wings not strongly fulvous; *Rs* approximately as long as cell *first* M_2_____2.
2. Tips of the femora conspicuously blackened; abdominal tergites uniformly light brown or yellow____3.
   Tips of the femora not blackened; abdominal tergites banded or at least the seventh segment blackish____4.
3. Size large (male, length, about 10 mm.); wings brownish yellow; male hypopygium with the gonapophyses prominent, acicular. (Regional.)_____ ***D. nigripes*** Osten Sacken.
   Size small (male, length, under 8 mm.); wings brown; male hypopygium with the gonapophyses small, not projecting. (Regional.)_______________ *D. minima* Alexander.
4. Coloration yellow, the wings deep yellow____________*D. winnemana* (p. 415).
   Coloration brown or gray; wings pale brownish or grayish_______________5.
5. Abdominal tergites uniformly dark brown or only the seventh segment darker; male hypopygium with the gonapophyses not acicular nor projecting____*D. sobrina* (p. 415).
   Abdominal tergites banded, the apical third of each segment pale; male hypopygium with the gonapophyses acicular, prominent. (Regional.)____ *D. tigrina* Alexander.

The immature stages are spent in rather dry soil beneath leaf mold.

* DICRANOPTYCHA SOBRINA Osten Sacken.

Abundant; season April 20 to September 5; in copula, May 28, August 22; comes to light. P. I.

* DICRANOPTYCHA WINNEMANA Alexander.

Plate 23, fig. 4.

Plummers Island, July 21, 1915; Virginia, near Plummers Island, August 22, 1916, McAtee.

Genus TEUCHOLABIS Osten Sacken.

KEY TO SPECIES.

1. Wing over 6 mm.; wings broad; *Sc* long, ending beyond two-thirds the length of the sector; *r* inserted on R_{2+3}; vein R_{2+3} not upturned at its tip, the end of cell *second* R_1 being much broader than the end of cell R_3; praescutum reddish, with three black stripes *T. complexa* (p. 416).
   Smaller, wing under 5 mm.; wings narrow; *Sc* short, ending before mid-length of the sector; *r* inserted at or near the end of *Rs;* vein R_{2+3} upturned at the tip, the end of cell R_3 being broader than the end of cell *second* R_1; praescutum shiny black, only the humeral parts of the sclerite light yellow *T. lucida* (p. 416).

The immature stages, as known, are spent beneath the bark of trees.

* TEUCHOLABIS COMPLEXA Osten Sacken.

Frequent in Piedmont localities; May 30 to August 28. P. I.

* TEUCHOLABIS LUCIDA Alexander.

Plate 23, fig. 5.

Dalecarlia Reservoir, District of Columbia, August 22, 1915, McAtee.

Tribe ERIOPTERINI.

KEY TO GENERA.

1. Three branches of media reaching the wing margin *Cladura* (p. 417).
   Two branches of media reaching the wing margin 2.
2. R_2 shorter than R_{2+3} 3.
   R_2 longer than R_{2+3} 4.
3. Cross vein *r* present; tuberculate pits retreated backward to near midlength of the praescutum *Erioptera* (subgenus *Empeda*) (p. 417).
   Cross vein *r* lacking; tuberculate pits located on the anterior part of the praescutum *Gonomyia* (p. 420).
4. *Rs* ending in cell R_2 *Molophilus* (p. 419).
   Rs ending in cell R_3 5.
5. A supernumerary cross vein in cell R_2; *second Anal* vein strongly bisinuate *Helobia* (p. 420).
   No supernumerary cross vein in cell R_2; *second Anal* vein not bisinuate 6.
6. Cu_1 tending to turn toward the wing apex; forks of the longitudinal veins very long and deep *Erioptera* (p. 417).
   Cu_1 straight or tending to turn away from the wing apex 7.
7. Sc_2 not far removed from the tip of Sc_1; coloration of local species deep black *Gnophomyia* (p. 422).
   Sc_2 retreated toward the base of the wing so that Sc_1 is usually more than two-thirds the length of the sector 8.
8. Wings glabrous; last three segments of the antennae abruptly smaller than the others *Trimicra* (p. 422).
   Wings pubescent; antennal segments gradually lessening in size toward the tip of the organ *Ormosia* (p. 422).

Genus CLADURA Osten Sacken.

* CLADURA FLAVOFERRUGINEA Osten Sacken.

Abundant; collected from October 6 to November 17; is attracted to light. P. I.

Genus ERIOPTERA Meigen.

KEY TO SPECIES.

1. Cell *first* M_2 open by the atrophy of the outer deflection of M_3 (subgenus *Mesocyphona* Osten Sacken) ---- 2.
   Cell *first* M_2 usually closed; if open it is by the atropy of *m* ---- 4.
2. Wings pale gray with small brown dots at the tips of the veins along the wing margin ---- *E.* (*M.*) *parva* (p. 419).
   Wings grayish or brown, with whitish dots or spots ---- 3.
3. Wings with abundant white dots in all the cells; each femur with two brown rings ---- *E.* (*M.*) *caloptera* (p. 418).
   Wings with about 20 large white spots that are confined to the region of the veins; each femur with a single brown ring before the tip ---- *E.* (*M.*) *needhami* (p. 419).
4. Cell *first* M_2 open by the atrophy of *m;* second anal vein arcuated, before its tip bent suddenly toward the first, so that cell *first A*, at its middle is about as broad or broader than at the margin (subgenus *Erioptera* Meigen) ---- 5.
   Cell *first* M_2 usually closed; anal veins divergent ---- 12.
5. Knobs of the halteres dark brown ---- *E.* (*E.*) *septemtrionis* (p. 419).
   Knobs of the halteres pale ---- 6.
6. Wings yellowish, some of the cross veins and deflections of veins with tiny brown dots ---- *E.* (*E.*) *chrysocoma* (p. 418).
   Wings yellowish or green, unmarked ---- 7.
7. Thorax reddish, the humeral region of the mesonotum yellowish ---- *E.* (*E.*) *vespertina* (p. 419).
   Thorax yellow or light green ---- 8.
8. Color of the body and wings light yellow ---- *E.* (*E.*) *straminea* (p. 419).
   Color of the body and wings light green ---- 9.
9. Male hypopygium with the two pleural appendages simple; eyes of the male very large; female ovipositor with the ventral margin of the tergal valves finely serrate. (Regional) ---- *E.* (*E.*) *chlorophylloides* Alexander.
   Male hypopygium with the ventral pleural appendage with a spine before the tip; female ovipostor longer, almost straight and the ventral margins of the tergal valves smooth ---- 10.
10. Spine on the ventral pleural appendage very long so the appendage appears almost evenly forked at its tip ---- *E.* (*E.*) *furcifer* (p. 418).
    Spine on the ventral pleural appendage smaller ---- 11.
11. Spine on the ventral pleural appendage located at the tip of the appendage; gonapophyses shaped like flattened paddles with the outer margin minutely serrated. (Regional) ---- *E.* (*E.*) *subchlorophylla* Alexander.
    Spine on the ventral pleural appendage small, located before the tip of the appendage; gonapophyses ending in a laterally directed chitinized horn. (Regional) ---- *E.* (*E.*) *chlorophylla* Osten Sacken.

12. Cell R_2 short, about as long as R_{2+3} alone (subgenus *Empeda* Osten Sacken)—*E.* (*E.*) *noctivagans* (p. 419).
    Cell R_2 deep, much longer than R_{2+3} alone—13.
13. A stump of a vein in cell *first M_2;* no brown bands on the femora (subgenus *Hoplolabis* Osten Sacken)—*E.* (*H.*) *armata* (p. 418).
    No stump of a vein in cell *first M_2;* femora banded with brown (subgenus *Acyphona* Osten Sacken)—14.
14. Wings with a broad brown band at the cord and a large brown basal spot—*E.* (*A.*) *venusta* (p. 419).
    Wings not so marked—15.
15. Coloration of body and wings more yellowish; an uninterrupted brown band along the cord; brown bands on the femora less extensive, the yellow area between them broad; basal deflection of Cu_1 at the fork of *M*—*E.* (*A.*) *armillaris* (p. 418).
    Coloration of body and wings more brownish, the markings on the wings less extensive and the band along the cord interrupted; bands on the femora very extensive, the yellowish area between them very narrow; basal deflection of Cu_1 before the fork of *M*—*E.* (*A.*) *graphica* (p. 418).

The immature stages are spent in wet earth along the banks of streams or other bodies of water.

* ERIOPTERA ARMATA Osten Sacken.

Common; season April 26 to September 6; has been collected on flowers of wild plum. P. I.

* ERIOPTERA ARMILLARIS Osten Sacken.

Hyattsville, Maryland, August 3, 1912, F. Knab; Eastern Branch near Benning, District of Columbia, August 29, 1915, McAtee; Great Falls, Virginia, October 21, Nathan Banks.

ERIOPTERA CALOPTERA Say.

Abundant; extreme dates of collection May 8 and September 23; often comes to light. P. I.

* ERIOPTERA CHRYSOCOMA Osten Sacken.

Dead Run, Virginia, June 6, 1914, R. C. Shannon; Beltsville, Maryland, June 23, 1918, McAtee.

* ERIOPTERA FURCIFER Alexander.

Common; season June 9 to August 3; is attracted to light. P. I.

* ERIOPTERA GRAPHICA Osten Sacken.

Plummers Island, July 9, 1916, H. L. Viereck; July 14, 1912; Little Falls, District of Columbia, August 22, 1915; Beltsville, Maryland, July 10, 1909, McAtee.

ERIOPTERA NEEDHAMI Alexander.

Plummers Island, August 9, 1915, at light, R. C. Shannon; Little Falls, District of Columbia, August 22, 1915, McAtee; Pimmit Run, Virginia, September 6, 1908, F. Knab; Eastern Branch near Bennings, District of Columbia, August 29, 1915; Oxon Run, Maryland, September 6, 1915, McAtee.

* ERIOPTERA NOCTIVAGANS Alexander.

Maywood, Virginia, October 19, 1915, at light, McAtee.

* ERIOPTERA PARVA Osten Sacken.

Fairly common; season July 25 to September 23; comes to light. V. P. I.

* ERIOPTERA SEPTEMTRIONIS Osten Sacken.

Common: collected from July 14 to October 19; often attracted to light. P. I.

ERIOPTERA STRAMINEA Osten Sacken.

Plummers Island, July 9, 1902, H. S. Barber; Maryland near Plummers Island, June 5, 1903, W. V. Warner.

ERIOPTERA VENUSTA Osten Sacken.

Common; has been collected from May 13 to October 4; comes to light. V. P. I.

* ERIOPTERA VESPERTINA Osten Sacken.

Difficult Run, Virginia, July 25, 1915, Alexander and McAtee; Washington, District of Columbia, September 23, 1906; Hyattsville, Maryland, August 2, 1908, F. Knab.

Genus MOLOPHILUS Curtis.

KEY TO SPECIES.

1. Size very small; wing about 2.5 mm.; basal deflection of R_{2+3} short, perpendicular, about as long as the radial cross vein; basal deflection of Cu_1 far before the fork of *M*---------------------------*M. ursinus* (p. 420).
   Size larger, wing over 2.6 mm.; basal deflection of R_{2+3} longer, oblique; basal deflection of Cu_1 near the fork of *M* (in *nova-caesariensis*) or beyond it on M_3--2.
2. Wings with a brownish cloud on the basal deflection of M_3 (Regional.)---- *M. comatus* (Doane).
   Wings without such a brown spot--3.
3. Antennae of the male elongated; coloration largely yellowish-------------- *M. pubipennis* (p. 420).
   Antennae short in both sexes; coloration black or brown-----------------4.

4. Size small, wing under 3.5 mm.; basal deflection of Cu_1 near the fork of *M*; base of the femora yellow, passing into black_M. *nova-caesariensis* (p. 420).
   Size larger, wing over 4 mm.; basal deflection of Cu_1 beyond the fork of *M* on M_3; base of the femora not coinspicuously brightened____________5.
5. Antennae dark colored; body coloration grayish brown____________________ *M. hirtipennis* (p. 420).
   Antennae with the basal segments pale; body coloration; pale brown. (Regional)________________________________*M. forcipula* (Osten Sacken).

The immature stages are spent in moist earth.

* MOLOPHILUS HIRTIPENNIS Osten Sacken.

Virginia near Plummers Island, Maryland, June 2, 1916, McAtee; Dead Run, Virginia, June 6, 1914; Maryland near Plummers Island, October 10, 1914, at light, R. C. Shannon; Lakeland, Maryland, September 25, 1909, F. Knab.

MOLOPHILUS NOVA-CAESARIENSIS Alexander.

Beltsville, Maryland, May 28, 1916; Dyke, Virginia, May 28, 1915, McAtee; Falls Church, Virginia, June 30, Nathan Banks. These specimens are more highly colored than the somewhat faded type specimen from New Jersey; the legs are jet black with the coxae, trochanters and femoral bases yellow.

* MOLOPHILUS PUBIPENNIS Osten Sacken.

Common; extreme dates of collection, May 29 and September 6; is attracted to light. P. I.

* MOLOPHILUS URSINUS Osten Sacken.

Plate 23, fig. 7.

Described from specimens collected at Washington, in spring.

Genus HELOBIA St. Fargeau and Serville.

HELOBIA HYBRIDA Meigen.

Common; extreme dates of capture, February 28 and October 22; has been collected on flowers of *Anthemis cotula;* the immature stages are spent in damp earth. P. I.

Genus GONOMYIA Meigen.

KEY TO SPECIES.

1. Two branches of the sector reaching the wing margin (subgenus *Leiponeura* Skuse) ____2.
   Three branches of the sector reaching the wing margin (subgenus *Gonomyia* Meigen)____3.

2. Outer deflection of vein M_3 lacking, cell *first* M_2 being open; costa china white; legs banded with white. (Regional.)------------------------------ *G.* (*L.*) *alexanderi* Johnson.
   Outer deflection of vein M_3 present, closing the cell *first* M_2; coloration not as above--*G.* (*L.*) *manca* (p. 421)
3. Basal deflection of Cu_1 far before the fork of *M*; *Sc* long, ending beyond the origin of the sector; wings spotted--------------*G.* (*G.*) *blanda* (p. 421).
   Basal deflection of Cu_1 at or beyond the fork of *M*; *Sc* short, ending opposite or before the origin of the sector; wings unmarked, except the stigmal spot -- 4.
4. Antennae orange at the base, the flagellum dark--------------------------5.
   Antennae dark throughout-------------------*G.* (*G.*) *subcinerea* (p. 421).
5. Cell *first* M_2 closed; femora with a dark brown subterminal ring------------- *G.* (*G.*) *sulphurella* (p. 421).
   Cell *first* M_2 open; femora without a dark ring-----*G.* (*G.*) *cognatella* (p. 421).

The immature stages are spent in damp earth or sand.

* GONOMYIA BLANDA Osten Sacken.

Falls Church, Virginia, June 7, 1914, R. C. Shannon.

* GONOMYIA COGNATELLA Osten Sacken.

Difficult Run, Virginia, July 25, 1915, Alexander, McAtee; Plummers Island, May 24, 1914, July 15, 1911, McAtee; Cabin John Bridge, Maryland, May 16, 1909, F. Knab.

GONOMYIA MANCA, Osten Sacken.

Glencarlyn, Virginia, May 30, Nathan Banks; Great Falls, Virginia, August 23, F. Knab; Difficult and Scotts Runs, Virginia, July 25, 1915, Alexander and McAtee; Plummers Island, July 15, 24, 1903, W. V. Warner; August 18, 1912, at light, H. L. Viereck; Maywood, Virginia, August 14, 1917, at light, McAtee; New Alexandria, Virginia, July, 1907, W. Palmer; Forest Glen, Maryland, June 1, 1913, F. Knab.

* GONOMYIA SUBCINEREA Osten Sacken.

Numerous records, ranging from May 11 to July 24; comes to light. P. I.

* GONOMYIA SULPHURELLA Osten Sacken.

Plate 23, fig. 8.

Falls Church, Virginia, May 3, Nathan Banks; Difficult Run, Virginia, July 25, 1915, Alexander, McAtee; Dead Run, Virginia, May 21, 1914; R. C. Shannon; Rosslyn, Virginia, May 11, 1913, F. Knab; Glencarlyn, Virginia, June 28, N. Banks; Four-mile Run, Virginia, May 31, 1914, McAtee; Washington, District of Columbia, May 31, 1914, Hyattsville, Maryland, August 2, 1908, F. Knab.

Genus GNOPHOMYIA Osten Sacken.

KEY TO SPECIES.

Wings pubescent apically; halteres entirely black--------*G. luctuosa* (p. 422).
Wings without an apical pubescence; knobs of the halteres yellow------------ *G. tristissima* (p. 422).

The immature stages of the known species are spent beneath the bark of decaying trees.

GNOPHOMYIA LUCTUOSA Osten Sacken.

Dead Run, Virginia, R. C. Shannon; Falls Church, Virginia, August 16, 1916, Tom Ketcher.

* GNOPHOMYIA TRISTISSIMA Osten Sacken.

Abundant; extreme dates of capture, May 5 and October 28; in copula, June 18; bred from tulip tree bark, May 5, 1913, R. C. Shannon. P. I.

Genus TRIMICRA Osten Sacken.

* TRIMICRA ANOMALA Osten Sacken.

Maywood, Virginia, October 16, 1915, at light, McAtee. The immature stages are spent in moist earth.

Genus ORMOSIA Rondani.

KEY TO SPECIES.

1. Wings spotted or clouded with darker------------------------------------2.
   Wings unicolorous or nearly so, the stigma only being darker--------------3.
2. Anal veins convergent; wings with numerous dark brown dots--------------- *O. innocens* (p. 422).
   Anal veins divergent; wings with pale clouds of dark-colored hairs---------- *O. nubila* (p. 423).
3. Cell *first* M_2 closed------------------------------------*O. nigripila* (p. 423).
   Cell *first* M_2 open---4.
4. Cell *first* M_2 confluent with cell M_3, the outer deflection of M_3 lacking-------5.
   Cell *first* M_2 confluent with cell M_3, *m* lacking---------*O. holotricha* (p. 422).
5. Thorax reddish, stigma indistinct------------------------*O. rubella* (p. 423).
   Thorax gray, stigma distinct---6.
6. Gonapophyses of male hypopygium minutely serrate---*O. serridens* (p. 423).
   Gonapophyses not serrate----------------------------*O. meigenii* (p. 423).

The immature stages are spent in moist earth.

* ORMOSIA HOLOTRICHA Osten Sacken.

Described from specimens collected at Washington, District of Columbia.

* ORMOSIA INNOCENS Osten Sacken.

Dead Run, Virginia, April 19, 1914, R. C. Shannon.

ORMOSIA MEIGENII Osten Sacken.

Great Falls, Virginia, April 20, 1916, common, McAtee.

* ORMOSIA NIGRIPILA Osten Sacken.

Described from specimens collected at Washington, District of Columbia.

* ORMOSIA NUBILA Osten Sacken.

Common; extreme dates of capture, April 4 and October 18; is attracted to sap and to light. V. P. I.

ORMOSIA RUBELLA Osten Sacken.

Beltsville, Maryland, September 28, 1919, McAtee.

* ORMOSIA SERRIDENS Alexander.

Great Falls, Virginia, April 20, 1916; Cabin John Bridge, Maryland, April 13, 1916, McAtee; April 11, 1915, R. C. Shannon.

Tribe LIMNOPHILINI.

KEY TO GENERA.

1. Sc_2 before the origin of the sector; antennae with 17 segments; wings pubescent ---------- *Ula* (p. 423).
   Sc_2 beyond the origin of the sector; antennae with not more than 16 segments; wings rarely pubescent ---------- 2.
2. Wings pubescent, at least apically ---------- 3.
   Wings with microscopic pubescence only ---------- 5.
3. Pubescence including the entire wing; cell M_1 absent ---- *Ulomorpha* (p. 424).
   Pubescence only on the apical cells of the wing; cell M_1 present or lacking -- 4.
4. Small species, wing less than 5.5 mm.; antennæ of both sexes short ---------- *Adelphomyia* (p. 424).
   Larger species, wing over 6 mm.; antennæ of the male elongated ---------- *Limnophila* (subgenus *Lasiomastix* Osten Sacken).
5. A supernumerary cross vein in cell *C* ---------- *Epiphragma* (p. 424).
   No supernumerary cross vein in cell *C* ---------- *Limnophila* (p. 424).

Genus ULA Haliday.

KEY TO SPECIES.

Antennae of the male elongate; wings dusky but without a distinct heavy brown pattern ---------- *U. paupera* (p. 423).
Antennae short in both sexes; wings with the cord and outer end of cell *first* M_2 seamed with brown ---------- *U. elegans* (p. 423).

The larvae are fungicolous, going into the earth to pupate.

ULA ELEGANS Osten Sacken.

Maywood, Virginia, October 15, 1915, at light, McAtee.

* ULA PAUPERA Osten Sacken.

Rosslyn, Virginia, August 25, 1912, F. Knab and J. R. Malloch.

Genus ULOMORPHA Osten Sacken.

The immature stages are spent in organic earth in cool, shaded woods.

ULOMORPHA PILOSELLA Osten Sacken.

Virginia near Plummers Island, June 2, 1916, McAtee.

Genus ADELPHOMYIA Bergroth.

ADELPHOMYIA AMERICANA Alexander.

Several records in the Piedmont region; July 25 to October 22. V. P. I.

Genus EPIPHRAGMA Osten Sacken.

KEY TO SPECIES.

Wings with pale brown crossbands which are margined with darker; a brown ring at the tip of each femur---------- *E. fascipennis* (p. 424).
Wings with an irregular pattern of brown and tawny; a brown ring before the tip of each femur---------- *E. solatrix* (p. 424).

The immature stages live beneath the damp bark of decaying trees.

EPIPHRAGMA FASCIPENNIS Say.

Frequent; April 20 to June 18. P. I.

* EPIPHRAGMA SOLATRIX Osten Sacken.

Common; season April 25 to September 5; comes to light; has been bred from rotten logs. P. I.

Genus LIMNOPHILA Macquart.

KEY TO SPECIES.

1. Cell M_1 of the wings present---------- 2.
   Cell M_1 of the wings lacking---------- 26.
2. A supernumerary cross vein in cell R_2 or in cell M---------- 3.
   No supernumerary cross vein in cell R_2 or in M---------- 4.
3. A supernumerary cross vein in cell R_2; wings broad, with numerous small dots and spots---------- *L. fuscovaria* (p. 426).
   A supernumerary cross vein in cell M; wings with about seven larger brown blotches along the costal margin---------- *L. aprilina* (p. 426).
4. Apical cells of the wings with a slight pubescence; antennæ of male elongated---------- 5.
   Apical cells of the wings not pubescent---------- 6.
5. Coloration shiny black; wings banded with brown---------- *L. macrocera* (p. 427).
   Coloration gray; wings not banded or marked with darker---------- *L. tenuicornis* (p. 428).
6. Thorax shiny black; male hypopygium enlarged and complicated in structure---------- *L. mundoides* (p. 427).
   Thorax not shiny black; male hypopygium simple in structure---------- 7.
7. Posterior tarsi white---------- *L. niveitarsis* (p. 427).
   Tarsi not white---------- 8.

8. Cross vein *r* removed from the tip of R_1, so that the distance beyond it is from one to one and one-half times the length of *r;* tuberculate pits present---------9.

Cross vein *r* at the tip of R_1; tuberculate pits lacking---------18.

9. Cell *first* M_2 very much elongated, the inner end lying far inside the level of the cord---------*L. areolata* (p. 426).

Cell *first* M_2 not greatly elongated, the inner end at the level of the cord--10.

10. R_{2+3} longer than cell R_2 alone; cross vein *r* on R_{2+3}---------*L. ultima* (p. 428).

R_{2+3} not longer than R_2 alone; cross vein *r* on R_2---------11.

11. Cell M_1 very short, not longer than the basal deflection of Cu_1--------- *L. brevifurca* (p. 426).

Cell M_1 long, more than half again as long as the basal deflection of Cu_1—12.

12. Head narrow, prolonged behind; cells R_3 and *first* M_2 longer than cell R_5, so that the cord is not in a straight line; radial and medial veins long, slender, arcuated; second anal vein incurved at the tip (*luteipennis* group)---------13.

Head broad, not narrowed behind; cells R_3, R_5, and *first* M_2, with their inner ends about on a level; radial and medial veins stout and straight; second anal vein not incurved at the tip (*tenuipes* group)---------16.

13. Wings with small dots on the cross veins and at the forks--------- Body shiny reddish yellow; front yellowish red---------*L. recondita* (p. 427).

Wings clear, unspotted---------14.

14. Thorax clear blue-gray---------*L. inornata* (p. 427).

Thorax brownish without gray---------15.

15. Pleura of thorax grayish, unmarked; size small. (Regional)--------- *L. contempta* Osten Sacken.

Pleura of thorax dull yellowish with a conspicuous dark-brown stripe extending from the cervical sclerites to the postnotum; size larger--------- *L. nigripleura* (p. 427).

16. Wings narrow, grayish; stigma distinct, hairy; antennae of the male elongated---------*L. tenuipes* (p. 428).

Wings broader, more yellowish brown; stigma indistinct; antennae short in both sexes---------17.

17. Body opaque; front gray. (Regional)---------*L. imbecilla* Osten Sacken.

Body shiny reddish yellow; front yellowish red---------*L. recondita* (p. 427).

18. Very large species; wings about 20 mm. long---------*L. alleni* (p. 426).

Smaller species; wings under 15 mm---------19.

19. R_{2+3} very long, nearly twice the length of R_2 alone; cross vein *r* on R_{2+3}---------*L. ultima* (p. 428).

R_{2+3} shorter, not longer than R_2 alone; cross vein in *r* on R_2---------20.

20. Basal deflection of Cu_1 at the inner end of cell *first* M_2; wings spotted with brown---------*L. montana* (p. 427).

Basal deflection of Cu_1 near the middle of cell *first* M_2---------21.

21. Wings spotted with brown or distinctly seamed along the cross veins and deflections of veins---------22.

Wings clear or with only the stigmal spot; *Rs* and R_{2+3} strongly arcuated; cell *first* M_2 broad---------*L. toxoneura* (p. 428).

22. Wings heavily irrorate with brown over the entire surface--------- *L. irrorata* (p. 427).

Wings not as above---------23.

23. *Rs* short, arcuated to almost square at its origin; *r* at about midlength of vein R_2 which is oblique; outer end of cell R_2 very broad, due to the oblique course of vein R_2; body yellow or reddish, the tips of the wings darkened---------*L. adusta* (p. 426).

Rs longer; vein R_2 not oblique and cell R_2 not conspicuously widened at its outer end; veins seamed with brown ---------- 24.

24. Larger species, wing of the male over 9 mm.; male with the pleural appendage of the hypopygium pectinate ---------- 25.

Smaller species, wing of the male under 8.5 mm.; male with the pleural appendage of the hypopygium not pectinate, rather sharply pointed ---------- *L. terebrans* (p. 428).

25. Larger species, wing of the male about 13 mm.; costal and subcostal cells of the wings rich yellow; stigma dark brown; bases of femora bright yellow; anterior apical appendage of male hypopygium bifurcate ---------- *L. rufibasis* (p. 427).

Smaller, wing of the male about 11.5 mm.; wings uniform light yellowish gray; stigma rather indistinct, grayish; bases of femora brownish yellow; anterior apical appendage of male hypopygium simple. (Regional) ---------- *L. simplex* Alexander.

26. Cell R_2 of the winds broadly sessile ---------- *L. emmelina* (p. 426).

Cell R_2 of the wings petiolate ---------- 27.

27. *Rs* short, about equal to vein R_2 ---------- *L. lenta* (p. 427).

Rs long, equal to about twice the length of vein R_2 ---------- *L. quadrata* (p. 427).

The immature stages of most of the local species are spent in moist earth. A very few species live beneath the bark of trees.

LIMNOPHILA ADUSTA Osten Sacken.

Dead Run, Virginia, June 29, 1915, R. C. Shannon; October 28, 1919, McAtee; Veitch, Virginia, June 9, 1912, F. Knab.

LIMNOPHILA ALLENI Johnson.

Great Falls, Virginia, May 23, 1918; Mount Vernon, Virginia, July 13, 1917, McAtee.

* LIMNOPHILA APRILINA Osten Sacken.

Great Falls, Virginia, August 11, 1915; Virginia near Plummers Island, September 5, 1915, Dead Run, Virginia, May 10, 1916, McAtee; Glencarlyn, Virginia, June 4, 11, 1911, F. Knab.

* LIMNOPHILA AREOLATA Osten Sacken.

Several records from May 2 to 24. V. P. I.

* LIMNOPHILA BREVIFURCA Osten Sacken.

Great Falls, Virginia, April 20, 1913; C. P. Heinrich, April 20, 1916, McAtee.

* LIMNOPHILA EMMELINA Alexander.

Great Falls, Virginia, April 20, 1913, F. Knab; Maryland near Plummers Island, May 2, 1915, R. C. Shannon; May 10, 1916, McAtee.

* LIMNOPHILA FUSCOVARIA Osten Sacken.

Frequent along streams; extreme dates of collection, May 16 to September 2; comes to light. V. P. I.

LIMNOPHILA INORNATA Osten Sacken.

Hyattsville, Maryland, May 21, 31, August 2, 1909, F. Knab; Dyke, Virginia, May 28, 1915, McAtee.

LIMNOPHILA IRRORATA Johnson.

Mount Vernon, Virginia, July 13, 1917, McAtee.

* LIMNOPHILA LENTA Osten Sacken.

Dead Run, Virginia, R. C. Shannon; Forest Glen, Maryland, May 30, 1914, McAtee.

* LIMNOPHILA LUTEIPENNIS Osten Sacken.

Common; season April 23 to October 10; frequently comes to light. P. I.

LIMNOPHILA MACROCERA Say.

Common; has been collected from May 4 to September 26; in copula, August 29. V. P. I.

* LIMNOPHILA MONTANA Osten Sacken.

Common; extreme dates of collection April 11 and May 11; all records are from Piedmont area. P. I.

* LIMNOPHILA MUNDOIDES Alexander.

Plummers Island, Maryland, June 3, 1914, R. C. Shannon; Beltsville, Maryland, June 9, 1915, McAtee.

LIMNOPHILA NIGRIPLEURA Alexander and Leonard.

Frequent; records date from May 28 to September 29; comes to light. V. P. I.

LIMNOPHILA NIVEITARSIS Osten Sacken.

Bladensburg, Maryland, May 10, 1917, McAtee.

LIMNOPHILA QUADRATA Osten Sacken.

Great Falls, Virginia, May 2, 1916, May 2, 1917; Virginia near Plummers Island, May 8, 1915, McAtee; Falls Church, Virginia, May 13, 17, 1914, A. Wetmore.

LIMNOPHILA RECONDITA Osten Sacken.

Frequent; season, May 20 to September 26; in copula, July 13. V. P. I.

* LIMNOPHILA RUFIBASIS Osten Sacken.

Common; extreme dates of collection April 18 to May 10; in copula, April 20, 27, May 2; comes to light. P. I.

LIMNOPHILA TENUICORNIS Osten Sacken.

Great Falls, Virginia, May 2, 1917, McAtee.

LIMNOPHILA TENUIPES Say.

Common; has been collected from May 20 to October 6; comes to light. P. I.

* LIMNOPHILA TEREBRANS Alexander.

Cabin John, Maryland, May 5, 1899.

LIMNOPHILA TOXONEURA Osten Sacken.

Plummers Island, June 8, 1913, June 2, 1916, McAtee.

* LIMNOPHILA ULTIMA Osten Sacken.

Frequent in fall, September 23 to October 23; comes to light. V. P. I.

Tribe HEXATOMINI.

KEY TO GENERA.

1. Cell *first* M_2 open; only one free branch of the media reaching the wing margin ---------- *Hexatoma* (p. 428).
   Cell *first* M_2 closed; two or three free branches of the media reaching the wing margin ---------- 2.
2. Tarsi (in the local species) pure white; stigma small; cell M_1 present ---------- *Penthoptera* (p. 428).
   Tarsi not white, concolorous or darker than the rest of the legs; cell M_1 lacking in the local species ---------- *Eriocera* (p. 429).

Genus HEXATOMA Latreille.

* HEXATOMA MEGACERA Osten Sacken.

Glencarlyn, Virginia, May 1, 1910, F. Knab; Cabin John Bridge, Maryland, April 28, 1912, J. R. Malloch. There is but a single described American species. The larvae are aquatic, but before pupation they come to earth for a short period.

Genus PENTHOPTERA Schiner.

PENTHOPTERA ALBITARSIS Osten Sacken.

Pimmit Run, Virginia, September 6, 1908, F. Knab; Difficult Run, Virginia, July 25, 1915, Alexander and McAtee; Dyke, Virginia, July 16, 1915, Mount Vernon, Virginia, June 19, 1918, Beltsville, Maryland, July 30, 1916, McAtee. *P. albitarsis* is the only known Nearctic species. The immature stages are spent in organic earth in woods, usually underneath a layer of leaf mold.

Genus ERIOCERA Macquart.

KEY TO SPECIES.

1. Coloration of the body yellow or yellowish red; antennae of the male elongated, the basal flagellar segments not armed with spines............... *E. wilsonii* (p. 429).

Coloration of the body brown, gray or almost black; antennae of the male short, if elongated, the segments at the base of the flagellum armed with small spines...............2.

2. Thoracic dorsum gray; male antennae elongated...............3.

Thoracic dorsum brown or black; antennae short in both sexes...............4.

3. Cell *first* M_2 short, pentagonal, usually with a small spur into cell *R*; valves of the ovipositor short, blunt, subfleshy............... *E. longicornis* (p. 429).

Cell *first* M_2 long, hexagonal; valves of the ovipositor elongated, pointed, chitinized............... *E. cinerea* (p. 429).

4. Wings brown, the stigma small, rounded, brown; abdominal tergites brown............... *E. fuliginosa* (p. 429).

Wings blackish brown, the stigma oval, dark brown; abdominal tergites black............... *E. tristis* (p. 429).

The early larval stages of the more common species of *Eriocera* are aquatic. When nearly full grown they are to be found in the sandy soil along the margins of rather large streams.

ERIOCERA CINEREA Alexander.

Pimmit Run, Virginia, September 6, 1908; Forest Glen, Maryland, June 1, 1913; Hyattsville, Maryland, August 2, 1913, F. Knab.

* ERIOCERA FULIGINOSA Osten Sacken.

Plummers Island, June 23, 1907, McAtee; Washington, District of Columbia, July 20, E. A. Schwarz.

ERIOCERA LONGICORNIS Walker.

Common; records all from Piedmont region, date from April 4 to July 30; this species is attracted to light. P. I.

ERIOCERA TRISTIS Alexander.

Frequent; has been collected in Piedmont localities from July 7 to September 1. P. I.

ERIOCERA WILSONII Osten Sacken.

Mount Vernon, Virginia, April 19, 1903.

Tribe PEDICIINI.

KEY TO GENERA.

1. Antennae with 16 segments...............2.

Antennae with 13 or 15 segments...............3.

2. Cord oblique; cell *first* M_2 very short, pentagonal; size large, wing over 20 mm.; palpi elongated............... *Pedicia* (p. 430).

Cord transverse; cell *first* M_2 elongate; size smaller, wing under 18 mm.; palpi short............... *Tricyphona* (p. 430).

3. Cross vein *r* present so three R_1 cells are present............... *Dicranota* (p. 431).

Cross vein *r* lacking, two R_1 cells being present............... *Rhaphidolabis* (p. 431).

Genus PEDICIA Latreille.

PEDICIA ALBIVITTA Walker.

Spring Hill, Virginia, September 21, 1911; Rosslyn, Virginia, October 6, 1912, F. Knab; Falls Church, Virginia, September 17, 1919, at light, L. O. Jackson; Thrifton, Va., October 15, 1919, in spider web, McAtee; Cleveland Park, District of Columbia, September 17, 1906, E. A. Preble. The immature stages are semiaquatic, living in cold springs, in saturated moss, and in similar situations. Practically all of the adults taken here have come to light or have been found in spider webs. Alexander has caught two species at light, and has found them sitting on tree trunks by day; the indications are therefore that *Pedicia* is crepuscular or nocturnal in its activities.

Genus TRICYPHONA Zetterstedt.

KEY TO SPECIES.

1. Cell R_3 of the wings short petiolate; *m–cu* obliterated by the fusion of Cu_1 with M_3; general coloration yellowish; wings with the costal region darkened---------*T. inconstans* (p. 430).
   Cell R_3 of the wings broadly sessile; *m–cu* present or barely obliterated by the fusion of Cu_1 with M_3; general coloration gray; wings with brown or gray spots and clouds---------2.
2. Antennae with the basal segments dull yellowish, notably brighter than the black flagellum; wings with a brownish tinge, marked with pale brown spots along the costal margin and pale gray clouds at the ends of the longitudinal veins; the mark at the origin of the sector does not pass into the costal cell; cell M_1 sessile or very short petiolate--*T. vernalis* (p. 430).
   Antennae black throughout; wings nearly hyaline, with large brown spots along the costal margin, the mark at the origin of the sector passing into the costal cell; cell M_1 long petiolate---------*T. macateei* (p. 430).

The immature stages are spent in moist earth.

* TRICYPONA INCONSTANS Osten Sacken.

Common and widespread; has been collected from April 20 to October 6. V. P. I.

* TRICYPONA MACATEEI Alexander.

Beltsville, Maryland, October 7, 1917; Bear Branch, Maryland, September 28, 1919, McAtee.

* TRICYPONA VERNALIS Osten Sacken.

Plate 23, fig. 10.

This species was described from specimens collected at Washington, District of Columbia, in April.

Genus DICRANOTA Zetterstedt.

KEY TO SPECIES.

1. Cell M_1 lacking__________2.
   Cell M_1 present__________*D. noveboracensis* (p. 431).
2. Halteres with the knobs darkened; antennae of male elongated, longer than the thorax__________*D. eucera* (p. 431).
   Halteres pale; antennae short in both sexes__________*D. rivularis* (p. 431).

The immature stages of the known species are spent in saturated earth.

* DICRANOTA EUCERA Osten Sacken.

Dead Run, Virginia, April 13, 1916, McAtee; Rosslyn, Virginia, March 24, F. Knab.

* DICRANOTA NOVEBORACENSIS Alexander.

Great Falls, Virginia, April 20, 1916; Dead Run, Virginia, April 23, 1914, April 16, 1915, R. C. Shannon.

* DICRANOTA RIVULARIS Osten Sacken.

Dead Run, Virginia, April 13, 1916, McAtee; Falls Church, Virginia, April 14, 1914, C. P. Heinrich.

Genus RHAPHIDOLABIS Osten Sacken.

KEY TO SPECIES.

Inner pleural appendage of the hypopygium a long, slender, chitinized blade which tapers gradually to the acute tip; ninth pleurite without a fingerlike lobe on the proximal face; gonapophyses shaped like the head and beak of a bird, the beak inserted just before the apex__________*R. tenuipes* (p. 431).

Inner pleural appendage of the small hypopygium scarcely longer than the small outer appendage, the apex obtusely rounded; ninth pleurite with a slender, fingerlike lobe on the proximal face; gonapophyses slender, the apex dilated and deeply bifid; the two lobes thus formed directed toward one another, pincerlike__________*R. persimilis* (p. 431).

The immature stages are semiaquatic.

* RHAPHIDOLABIS PERSIMILIS Alexander.

Difficult Run, Virginia, October 28, 1917, McAtee; April 20, 1913, C. P. Heinrich; Dead Run, Virginia, May 10, 1916, Virginia near Plummers Island, September 5, 1915, McAtee.

RHAPHIDOLABIS TENUIPES Osten Sacken.

Dead Run, Virginia, September 27, 1914, R. C. Shannon.

Subfamily CYLINDROTOMINAE.

Genus LIOGMA Osten Sacken.

***LIOGMA NODICORNIS Osten Sacken, var. FLAVEOLA Alexander.**

Great Falls, Virginia, May 22, Nathan Banks; May 23, 1918, in copula, McAtee; Falls Church, Virginia, June 7, Nathan Banks; Glencarlyn, Virginia, June 11, 1911, F. Knab; June 1, 1919, Maryland; near Plummers Island, June 2, 1916; Beltsville, Maryland, June 18, 1916, McAtee. The present species is the only member of the interesting group Cylindrotominae as yet found in the region under consideration. The local specimens represent a variety which is much more yellow than the typical northern *L. nodicornis*. The immature stages of species of this genus are terrestrial, living in cushions of mosses of the genus *Hypnum* and related forms.

RECENT SYNONYMY.

Certain names applied to species of crane-flies that have been recorded from the District of Columbia region are omitted from this paper. In each case, however, these names are synonyms of others which are here recorded. Synonyms that have been known for many years may be consulted in Aldrich's Catalogue.[1] The more recent synonymy is herewith listed:

**Dicranomyia curvivena* Coquillett =*Gonomyia manca* Osten Sacken.
Erioptera dulcis Osten Sacken (eastern records only) =*E. needhami* Alexander.
Erioptera chlorophylla Osten Sacken (in part) =*E. furcifer* Alexander.
Cladura indivisa Osten Sacken =*C. flavoferruginea* Osten Sacken.
Eriocera antennaria Doane =*E. wilsonii* Osten Sacken.
Tipula calva Doane =*T. valida* Loew.
T. cincta Loew =*T. iroquois* Alexander.
T. costalis Say =*T. sayi* Alexander.
T. cuspidata Doane =*T. submaculata* Loew.
T. devia Dietz =*T. translucida* Doane (?).
T. fasciata Loew =*T. hermannia* Alexander.
T. filipes Walker =*T. perlongipes* Johnson.
T. flavicans Fabricius =*T. ultima* Alexander.
T. inermis Doane =*T. umbrosa* Loew.
T. infuscata Loew =*T. cunctans* Say.
T. speciosa Loew =*T. fuliginosa* (Say).
T. suspecta Loew =*T. fragilis* Loew.
**T. winnemana* Alexander =*T. johnsoniana* Alexander.

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[1] J. M. Aldrich, A catalogue of the North American Diptera, 1905.

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ALEXANDER, CHARLES P.

New or little-known crane-flies from the United States and Canada. Tipulidae, Diptera. Proc. Acad. Nat. Sci. Philadelphia, vol. 66, pt. 3, 1914 (Feb. 16, 1915), pp. 579–606, pls. 25–27.

Describes a new species of *Rhipidia*, records another, and describes a new *Limnophila* from our region.

The biology of the North American crane-flies (Tipulidae, Diptera). IV. The tribe Hexatomini. Journ. Ent. Zool., vol. 7, No. 3, Sept. 1915, pp. 141–158, pls. 1–2.

Records 3 species.

New nearctic crane-flies in the United States National Museum. Insecutor Inscitiae Menstruus, vol. 3, Nos. 11–12, Nov.–Dec. 1915, pp. 127–142.

Contains the original description of *Tipula winnemana*, p. 137, now considered a synonym of *T. johnsoniana* Alexander.

New or little-known crane-flies from the United States and Canada; Tipulidae, Diptera, part 2. Proc. Acad. Nat. Sci. Philadelphia, vol. 67, pt. 3, Sept. 1915, Jan. 1916, pp. 458–514, pls. 16–21.

Discusses 8 of Loew's species of *Tipula* described from District of Columbia material, and records the selection in 3 cases as lectotypes of specimens collected here. Contains mention of 7 other species of *Tipula*, the original descriptions of 6 of them based wholly or in part on local material.

New nearctic crane-flies (Tipulidae, Diptera). Can. Ent., vol. 48, No. 2, Feb. 1916, pp. 42–53.

Describes from the region one new species of *Dicranomyia* and one of *Teucholabis*.

New Limnophiline crane-flies from the United States and Canada (Tipulidae, Diptera). Journ. N. Y. Ent. Soc., vol. 24, No. 2, June, 1916, pp. 118–125.

Two new species of *Limnophila* of local origin.

New or little-known crane-flies from the United States and Canada; Tipulidae, Ptychopteridae, Diptera, part. 3. Proc. Acad. Nat. Sci. Philadelphia, vol. 68, pt. 3, Oct. 1916, pp. 486–549, pls. 25–31.

Records 12 local species, 2 new.

New nearctic crane-flies (Tipulidae, Diptera), part. 3. Can. Ent., vol. 49, No. 6, June, 1917, pp. 199–211.

One new species of *Erioptera* from our region.

New nearctic crane-flies (Tipulidae, Diptera), part 4. Can. Ent., vol. 50, No. 2, Feb. 1918, pp. 60–71.

Two new species of *Tipula* based, one wholly, one in part, on local material.

Notes on the genus Dicranoptycha Osten Sacken (Tipulidae, Diptera). Ent. News, vol. 30, No. 1, Jan. 1919, pp. 19–22.

Records 2 species from our region.

New nearctic species of the genus Erioptera Meigen (Tipulidae, Diptera). Bull. Brooklyn Ent. Soc., vol. 14, June, 1919, pp. 104–108.

Describes a new species of the *chlorophylla* group.

New nearctic crane flies (Rhyphidae and Tipulidae, Diptera), part 7. Can. Ent., vol. 51, No. 7, July, 1919, pp. 162–172.

Describes a new species of *Tricyphona* from this region.

ALEXANDER, CHARLES P.—Continued.

New nearctic crane flies (Tipulidae, Diptera), part 8. Can. Ent., vol. 51, Nos. 8–9, Aug.-Sept., 1919, p. 195.

Liogma nodicornis flaveola new subspecies described, type locality Great Falls, Virginia.

New species of Eriopterine crane flies from the United States. Insecutor Inscitiae Menstruus., vol. 7, Nos. 7–9, July–Sept., 1919 (Nov. 17), pp. 143–144.

Ormosia serridens, new species based on local collections.

Two undescribed Pedicüne crane-flies from the United States (Tipulidae, Diptera). Can. Ent., vol. 52, No. 4, April, 1920, pp. 78–80.

Describes *Rhaphidolabis persimilis* from this region.

A new species of Tipula. Journ. Ent. and Zool. (Pomona), vol. 12, pp. ——, 1920.

Describes *T. mallochi* in part from local material.

BANKS, NATHAN.

At the Ceanothus in Virginia. Ent. News, vol. 23, No. 3, March, 1912, pp. 102–110.

Geranomyia rostrata on this flower at Falls Church, Virginia.

CAUDELL, A. N.

Notes on the yellow crane fly, *Tipula flavicans* Fab. Proc. Ent. Soc. Wash., vol. 15, No. 1. 1913, pp. 45–46.

Habits of *Tipula ultima*.

COQUILLETT, D. W.

New genera and species of Diptera. Proc. Ent. Soc. Wash., vol. 9, 1907 (1908), pp. 144–148.

Contains the original description of *Dicranomyia curvivena*, now considered a synonym of *Gonomyia manca* Osten Sacken.

DIETZ, WILLIAM G.

A revision of the North American species of the Tipulid genus Pachyrhina Macquart, with descriptions of new species (Diptera). Trans. Amer. Ent. Soc., vol. 44, pp. 105–140, June 10, 1918.

Three news species are based wholly or in part on local material.

The Streptocera group of the Dipterous genus Tipula Linnaeus. Ann. Ent. Soc. Amer., vol. 12, June, 1919, pp. 85–94, pl. 5.

Describes *Tipula devia* from Plummers Island. This is apparently the same as *T. translucida* Doane.

KNAB, F.

The feeding habits of Geranomyia. Proc. Ent. Soc. Wash., vol. 12, No. 2, 1910, pp. 61–65.

Notes on the flower frequenting habits of three species of crane flies. The *Geranomyia diversa* of this paper is in reality *Toxorhina muliebris*.

LOEW, H.

Diptera Americae septentrionalis indigena. Centuria quarta, vol. 1, 1861, pp. 164–181.

Describes 6 species of *Tipula* and 3 of *Pachyrhina* from the District of Columbia; one of the latter, *P. unifasciata*, is now placed in the genus *Tipula*. The *Tipula suspecta* of this paper probably is *T. fragilis*, and the *T. cincta* has been renamed *T. iroquois* Alexander.

Centuria quinta, vol. 1, 1861, pp. 219–225.

Describes *Tipula fraterna* and *Pachyrhina virescens* from local material.

McAtee, W. L.

A sketch of the natural history of the District of Columbia, etc. Bull. 1, Biol. Soc. Wash., May, 1918, 142 pp., 5 maps.

Notes Osten Sacken's work on District of Columbia Tipulidae and makes incidental mention of *Molophilus nova-caesariensis.*

Osten Sacken, C. R.

New genera and species of North American Tipulidae with short palpi, with an attempt at a new classification of the tribe. Proc. Acad. Nat. Sci. Philadelphia, vol. 11, pp. 197–256, pls. 3–4, August, 1859.

This remarkable pioneer paper, which firmly established the basis of classification of the smaller crane flies, records 46 species from the District of Columbia, 42 of them being described as new. Of these only 2 have since been found to be synonyms—namely, *Geranomyia communis*, which equals *G. canadensis* Westwood, and *Limnobia defuncta*, which equals *Dicranomyia simulans* Walker.

Descriptions of nine new North American Limnobiaceae. Proc. Acad. Nat. Sci. Philadelphia, vol. 13, pp. 287–292, September, 1861.

Describes *Trimicra anomala* and *Amalopis vernalis* from Washington, District of Columbia.

Description of some new genera and species of North American Limnobina. Proc. Ent. Soc. Philadelphia, vol. 4, 1865, pp. 224–242.

Describes *Triogma nodicornis* from material in part of local origin.

On the North American Tipulidae. Monographs of the Diptera of North America, part 4, Smithsonian Misc. Coll., pp. 1–320, pls. 1–4, January, 1869.

Records 64 species from our region, 5 of which are described as new.

Studies on Tipulidae. Part 1. Review of the published genera of the Tipulidae longipalpi. Berlin. Ent. Zeitschr., vol. 30, 1886, pp. 153–188.

Records *Brachypremna dispellens.*

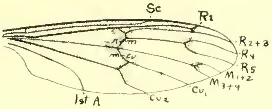
EXPLANATION OF PLATE 23.

VENATION OF LOCAL GENERA OF CRANE-FLIES.

Fig. 1. *Ptychoptera* (*japonica* Alexander).
2. *Geranomyia canadensis* Westwood.
3. *Rhamphidia flavipes* Macquart.
4. *Dicranoptycha winnemana* Alexander.
5. *Teucholabis lucida* Alexander.
6. *Erioptera* (*elegantula* Alexander).
7. *Molophilus ursinus* Osten Sacken.
8. *Gonomyia sulphurella* Osten Sacken.
9. *Limnophila* (*inconcussa* Alexander).
10. *Tricyphona vernalis* Osten Sacken.

Names in parentheses represent exotic species, the others are local forms.

Explanation of symbols: Longitudinal veins: *C*=costa; *Sc*=subcosta; *R*=radius; *M*=media; *Cu*=cubitus; *A*=anal veins; *Rs*=radial sector or praefurca. Cross veins: *r*=radial; *r-m*=radio-medial; *m*=medial; *m-cu*=medio-cubital.



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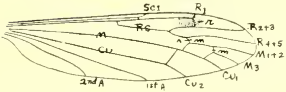

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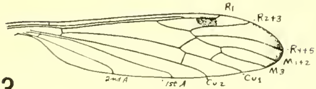

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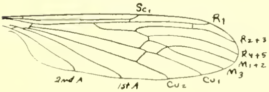

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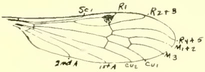

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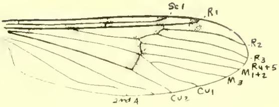

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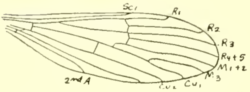

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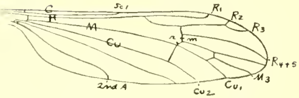

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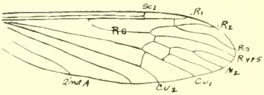

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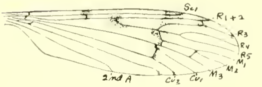

10

THE VENATION OF LOCAL GENERA OF CRANE-FLIES.

FOR EXPLANATION OF PLATE SEE PAGE 435.

NOTES ON ANGLESITE, ANTHOPHYLLITE, CALCITE, DATOLITE, SILLIMANITE, STILPNOMELANE, TETRAHEDRITE AND TRIPLITE.

By Earl V. Shannon,
Assistant Curator, Department of Geology, United States National Museum.

ANGLESITE CRYSTALS FROM GUNNISON COUNTY, COLORADO.

A specimen in the United States National Museum (Cat. No. 83,588), which was received from the United States Geological Survey in 1895, contains numerous small crystals of anglesite. This specimen was collected by S. F. Emmons in the Daisy Mine, Redwell Basin, Gunnison County, Colorado.

The specimen consists of a mass of ocherous and cellular limonite, upon and in the cavities of which the anglesite crystals are scattered. These crystals, which reach an extreme diameter of about 7 millimeters, are all identical in combination but differ slightly in form, the larger individuals being tabular parallel to d(102), while the smaller and more perfect crystals are prismatic by elongation parallel to the $\bar{b}$ axis, the appearance being as illustrated in figure 1. The forms identified on these crystals are as follows: Pinacoids, c (001), b(010). Prisms, m(110), $\varkappa$(130). Domes, o(011), ϑ(021), d(102). Pyramid, s(132).

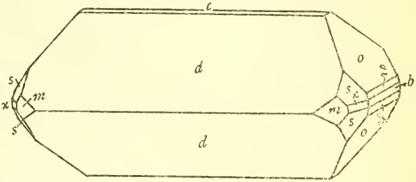

Fig. 1.—Crystal of anglesite.

The faces of the prism χ(130) and the pyramid s(132) are completely rounded and etched. The remaining faces are brilliant and yield excellent reflections of the signal, although the dome d(102) is commonly striated parallel to the elongation.

ANGLESITE CRYSTALS FROM THE TINTIC DISTRICT, UTAH.

The anglesites from the Tintic district are now rather widely distributed and are consequently well known. They have been described by Farrington,[1] Rogers,[2] and Hülyak.[3] The extreme variability of anglesite in form and habit makes it profitable to examine the crystals on each specimen of this material; often two distinctly different types of crystals occur on opposite sides of the same specimen. The United States National Museum collections contain three large exhibition specimens of this Utah material which have not, heretofore, been examined crystallographically. A study of these crystals shows them all to be somewhat different in development from the Utah anglesites already described. A single form new to the species was observed, together with two additional forms not previously found on the anglesite from this locality.

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[1] Farrington and Tillotson, Field Col. Mus. Pub. 3, vol. 7, p. 131, 1908.

[2] Rogers, A. F., School of Mines Quart., vol. 23, p. 135, 1902.

[3] Hülyak, Zeitsch. Kryst., vol. 36, p. 201.

The anglesite from the Tintic district or from Eureka, as it is generally labeled, occurs as brilliant adamantine crystals like those of Monte Poni implanted in cavities in solid masses of granular galena. They are usually highly lustrous and perfectly transparent and limpid. The smoky tint so common in the Sardinian specimens is rarely encountered, and the dull, pitted, and opaque appearance so characteristic of the Pennsylvania crystals is entirely absent in the Utah, as in the Idaho anglesites.

The specimens of galena on which these crystals occur are too large to be displayed in the systematic mineral collection, and are now in the exhibition series of lead-silver ores.

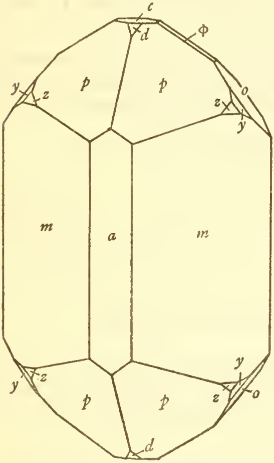

FIG. 2.—CRYSTAL OF ANGLESITE.

The first of these (Cat. No. 63717) is from the Eureka Hill mine, Tintic district, and was purchased from George L. English & Company in 1895. It consists of a large mass, weighing approximately 5 kilograms, of granular galena, containing parallel streaks and inclusions of gray limestone. About one-third of the broad surface of this mass is occupied by a flat cavity completely lined with brilliant transparent colorless crystals of anglesite, which reach a length of 1 centimeter. Scattered among the anglesite crystals and at times included in them are small globules of greenish translucent native sulphur. The crystals on this specimen are all of the same habit. They are prismatic parallel to the vertical axis, the dominant forms being the unit prism $m(110)$ and the pyramid $p(324)$. The forms observed on this type of crystal are $a(100)$, $m(110)$, $c(001)$, $d(102)$, $o(011)$, $\phi(012)$, $z(111)$, $y(122)$, and $p(324)$. The faces are clear and yield sharp signals. The prism zone is commonly striated parallel to the $\acute{c}$ axis by oscillation between the front pinacoid $a(100)$ and the prism $m(110)$. The forms and appearance of these crystals are shown in figure 2.

A second specimen, a more recent accession (No. 93235), was donated by I. Pett, of Salt Lake City, through V. C. Heikes. The locality is given as the Eagle and Bluebell mine, Tintic district, Juab County, Utah. This specimen consists of a 5-kilogram mass of granular galena containing inclusions of limestone and containing small round cavities, in which the anglesite crystals are deposited. The crystals range from those 2 centimeters in diameter down to some a millimeter in diameter. The largest crystals are slightly smoky, but the smaller ones are very clear and brilliant. No native sulphur or other secondary product is associated with this anglesite. The commonest habit of these crystals is as shown in figure 3, short prismatic, parallel to the vertical axis. The number of forms present varies directly with the size of the crystals, the larger individuals exhibiting the rare or unusual forms. On crystals of this type the forms found are *a*(100), *b*(010), *c*(001), *d*(102), *l*(104), *o*(011), *m*(110), *n*(120), *N*(310), ϰ(130), *r*(112), *z*(111), τ(221), *p*(324), and *y*(122). The prism zone is vertically striated.

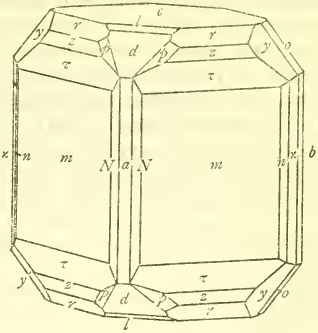

FIG. 3.—CRYSTAL OF ANGLESITE.

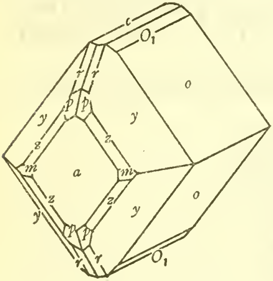

FIG. 4.—CRYSTAL OF ANGLESITE.

In a smaller cavity on one side of this specimen there were small groups of crystals in parallel position, which, while having the same general appearance, were elongated parallel to the *a* axis. The appearance of these crystals is shown in figure 4, the forms present being *a*(100), *c*(001), *m*(110), ϰ(130), *o*(011), O_1(023)*, *z*(111), *p*(324), and *r*(112).

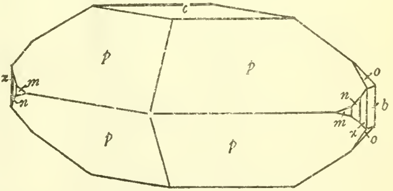

FIG. 5.—CRYSTAL OF ANGLESITE.

The third and largest specimen of Utah anglesite in the National collections (Cat. 93263) is also from the Eagle and Bluebell mine, and was received from W. H. Parker through V. C. Heikes. This is a mass of galena about 10 kilograms in weight, the upper surface of which is covered with a drusy layer of quartz with small blades of barite. Upon this surface are scattered crystals of anglesite which reach an extreme diameter of 1 centimeter. Two prominent habits are represented—one tabular to pyramidal with *p*(324) predominating, the second short prismatic parallel to the *a* axis. These two types occur at opposite ends of the specimen and are not intermixed. A typical crystal of the pyramidal type is shown in figure 5, the forms present being *p*(324), *c*(001), *b*(010), *o*(011), *m*(110), *n*(120), and ϰ(130). A more tabular individual shown in figure 6 has the additional forms *y*(122), *z*(111), and *r*(112). The short prismatic type found on these specimens is illustrated in figure 7, the forms being *a*(100), *b*(010), *c*(001), *l*(104), *d*(102), *o*(011), *N*(310), *m*(110), *n*(120), ϰ(130), *y*(122), and *z*(111).

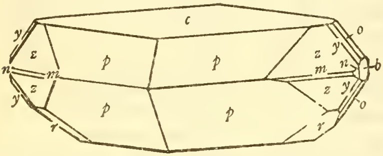

FIG. 6.—CRYSTAL OF ANGLESITE.

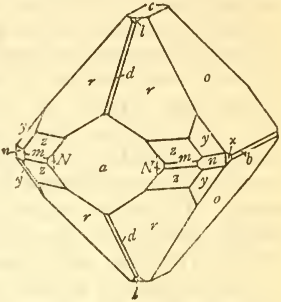

FIG. 7.—CRYSTAL OF ANGLESITE.

A complete list of forms thus far reported from this locality is given in the table below:

Forms on Utah anglesite.

Form.	Symbol.	Authority.
a	(100)	Farrington, etc.
b	(010)	Do.
c	(001)	Do.
m	(110)	Do.
M	(410)	Do.
δ	(230)	Do.
n	(120)	Do.
o	(011)	Do.
d	(102)	Do.
l	(104)	Do.
r	(112)	Do.
z	(111)	Do.
τ	(221)	Do.
p	(324)	Do.
y	(122)	Do.
μ	(124)	Do.
h	(340)	Hulyak.
κ	(130)	Do.
C	[1] (10–7–0)	Do.
D	[1] (1–0–16)	Do.
Y	[1] (209)	Do.
v	[1] (9–12–1)	Do.
𝔳	[1] (25–25–17)	Do.
𝔳.	[1] (14–14–9)	Do.
𝔳:	[1] (15–15–11)	Do.
φ	(012)	Shannon.
O_1	[1] (023)	Do.
N	(310)	Do.

[1] New from this locality.

In the present studies Hulyak's new forms were not observed nor were *M*(410) or δ(021) seen. Of the forms found, two φ(012) and *N*(310), are new to the locality. O^1(023) is a previously undescribed dome which has the following angles:

	Measured.	Calculated.
c (001) ∧ O_1 (023) =	41° 32′	40° 41′

Since it was observed only on one crystal and the observed and the calculated angles do not compare very favorably this must be regarded as a doubtful form.

ANGLESITE CRYSTALS FROM THE HERCULES MINE, COEUR D'ALENE DISTRICT, IDAHO.

The Hercules mine at Burke, in the Coeur d'Alene District, produced from its upper levels many hundreds of tons of cerussite ore, in much of which the cerussite was in fine crystals. Many beautiful specimens of pyromophite and native silver and some plattnerite have also been obtained from this mine, but thus far anglesite has not been recorded from this or any other mine in the Canyon Creek section. The writer was much interested, therefore, to find in the United States National Museum collections a specimen (Cat No. 77069–87) showing well-crystallized anglesite.

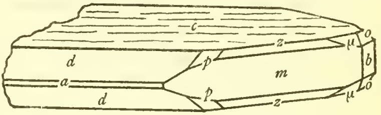

FIG. 8.—CRYSTAL OF ANGLESITE.

The specimen which was labeled "ore, native silver," is a mixture of earthy limonite with massive anglesite, looking precisely like the majority of specimens of carbonate lead ore. Implanted upon this earthy mass are numerous well-defined transparent anglesite crystals. Over the anglesite crystals are strung dendritic crystalline wires of native silver, now entirely blackened exteriorly by a tarnish of silver sulphide.

The anglesite crystals are tabular in development, the shape being determined by the forms *c*(001), *m*(110), and *d*(102). They reach an extreme length of 2 cm., although the average is about 3 millimeters, with a thickness of 1 millimeter. They fall in two types depending on the accessory forms present. Type 1 as shown in figure eight has as the dominant forms *c*(001), *m*(110), and *d*(102). As accessory forms there are represented *a*(100), *b*(010), *z*(111), *o*(011), μ(124), and *p*(324). Type 2 (fig. 9) has the same gen-

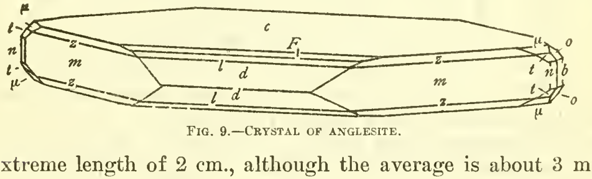

FIG. 9.—CRYSTAL OF ANGLESITE.

eral aspect determined by $c(001)$, $m(110)$, and $d(102)$. In this type, $p(324)$ and $a(100)$ are absent, and in their stead there were found the prism $n(120)$, pyramid $t(121)$, and domes $l(104)$ and $F_1(1\text{–}0\text{–}14)$.

The total of 13 forms found may be listed as follows:

Pinacoids: $a(100)$, $b(010)$, $c(001)$.
Macrodomes: $d(102)$, $l(104)$, F_1*$(1\text{–}0\text{–}14)$.
Brachydome: $o(011)$.
Prisms: $m(110)$, $n(120)$.
Pyramids: $z(111)$, $\mu(124)$, $p(324)$, $t(121)$.

The new dome $F_1(1\text{–}0\text{–}14)$ was observed only once as a very narrow line face yielding a rather poor signal. The observed and calculated angles are as follows:

	Measured	Calculated.
$c(001) \wedge F_1(1\text{–}0\text{–}14)$	=6°55′	6°41′

CALCITE CRYSTALS FROM THE OVERLOOK MINE, PIONEERVILLE DISTRICT, IDAHO.

A specimen of ore from the Overlook Mine, Pioneerville district, Boise County, Idaho, contains well-developed crystals of calcite. Calcite is commonly present in the gold ores of many southern Idaho mines, but where the mineral forms well-developed crystals these almost invariably take the form of very flat rhombohedrons. The present crystals are so different from this prevailing type that they merit a short note, although displaying no new forms. This is especially true, since the writer has long held the view that the crystallographic development assumed by the omnipresent mineral calcite is an important criterion in ore-bearing veins, capable of indicating the temperature and to some extent the composition of the solutions from which it crystallized.

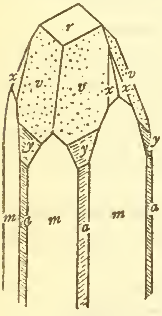

FIG. 10.—CRYSTAL OF CALCITE.

The specimen in question consists of a breccia of greatly bleached and altered angular fragments of what appears to have been originally an acidic lava or other fine-grained igneous rock, cemented by masses of coarse cleavable galena and pyrite in a gangue of calcite and quartz. The calcite crystals which line a small cavity are prismatic in development and reach a length of 1 centimeter. They are transparent and colorless. The aspect is like figure 10, the forms present being identified as $m(10\bar{1}0)$, $a(11\bar{2}0)$, $v(21\bar{3}1)$, $r(10\bar{1}1)$, $y(32\bar{5}1)$, and $x(13\bar{4}1)$.[1]

---

[1] When the drawing was made the form marked x $(13\bar{4}1)$ was thought to be another scalenohedron having the indices $(3\text{–}9\text{–}\overline{12}\text{–}4)$. Some small discrepancy has thus resulted, the difference being insufficient to make it advisable to redraw the figure.

The specimen is from an unstudied collection of ores, made by Edward L. Jones, Jr., formerly of the United States Geological Survey. The writer is indebted to Dr. F. L. Ransome for freely consenting to the present use of the material.

CRYSTALLIZED TETRAHEDRITE FROM THE HYPOTHEEK MINE, PINE CREEK DISTRICT, IDAHO.

Tetrahedrite occurs commonly in the Hypotheek mine in the Pine Creek district of Idaho in a portion of the vein which is barren of galena, and contains, in addition to the tetrahedrite, chalcopyrite, pyrite, and arsenopyrite in a gangue of quartz, calcite, and siderite.[1] Tetrahedrite is very rare in this district, although it occurs commonly in veins of a different type in the adjoining Coeur d'Alene district. In this general region the tetrahedrite is usually massive and more or less highly argentiferous. The specimens from the Hypotheek mine examined by the writer are those collected by Jones, and they are labeled as coming from the old workings east of the fault on the 700-foot level.

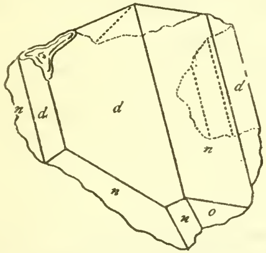

FIG. 11.—CRYSTAL OF TETRAHEDRITE.

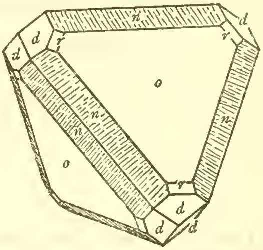

FIG 12.—CRYSTAL OF TETRAHEDRITE.

The specimens consist of coarse vitreous white vein quartz containing the greasy appearing gray tetrahedrite filling narrow veins. Small open cracks in the quartz are lined with minute quartz crystals and well-bounded crystals of tetrahedrite which reach five millimeters in diameter. Most of these show bright faces, which yield excellent reflections of the signal. The development is such, however, that the tetrahedral symmetry is not apparent. A typically developed crystal is shown in figure 11. The most completely developed and symmetrical crystal measured is shown in somewhat idealized form as figure 12. The forms recognized are $o(111)$, $n(211)$, $d(110)$, and $r(332)$.

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[1] Jones, E. L. Jr. A Reconnaissance of the Pine Creek Dristrict, Idaho, Bull. U. S. Geol. Surv. No. 710-A. p. 27.

It is possible by careful picking under a lens to free the mineral for analysis from all visible impurities except quartz. A portion of 1 gram gave the following results:

Analysis of tetrahedrite, Hypotheek Mine.

	Per cent.
Quartz	13. 57
Sb	23. 03
Fe	4. 41
Cu	32. 38
Zn	3. 33
Ag	Trace
As	Trace
Pb	None
Bi	Trace
S	22. 74
Total	99. 46

With impurities deducted the figures recalculated to 100 per cent, yield:

Recalculated analysis of tetrahedrite.

Sb	26. 81
Fe	5. 13
Cu	37. 70
Zn	3. 87
S	26. 49
	100. 00

In view of its mode and place of occurrence the mineral is unique in the absence of appreciable amounts of silver and arsenic, especially the latter, since arsenic is common as arsenopyrite in the same vein. Owing to the small amount of material available it was impossible to prove the absence of zonal structure in the crystals. The analysis consequently gives no basis for speculation as to the constitution of the mineral.

TRIPLITE FROM CHATHAM, CONNECTICUT.

Some specimens of a brownish-red massive mineral supposed to be triplite were shown the writer by Prof. William North Rice, and with the aid of directions furnished by Professor Rice the locality from which these specimens came was found and several specimens were collected. Laboratory study of this mineral confirms the original identification, the mineral being a normal triplite rather low in iron, though not so low as one recently described by Hess and Hunt.

The mineral occurs imbedded in platy aggregates of the cleavelandite variety of albite in a mass of pegmatitic material largely consisting of quartz and lepidolite. These minerals came from a small cut which is largely filled in with leaves and soil, and the relations of the lithia rich pegmatite are not shown. Surrounding exposures consist of a normal granite-pegmatite of ordinary composition quite free from unusual accessory minerals. At least two great dikes of normal pegmatite are exposed here. These are just north of the Chatham-Haddam town line and propably represent the continuation of the same pegmatite quarried at the famous Gillette Haddam Neck quarry, which is not far distant in the line of strike. The lithia-rich material forms a segregation, or, more probably, a slightly later complementary intrusion, in the main mass of the granite pegmatite. The material removed from the cut consists almost entirely of lepidolite and white quartz in nearly equal amounts. Feldspar of the ordinary kind is entirely absent. The lepidolite was mined for export for its lithia content, but most of that extracted is still lying around the pit. The platy clevelandite contains a few crystals of muscovite penetrated by crystals of opaque green tourmaline and bordered by lepidolite in parallel growth. The triplite occurs in irregular masses, which may reach 10 centimeters in diameter, ranging in color from flesh red to dark brownish red. The cleavage is not pronounced and the material resembles massive garnet. Intergrown intimately with the triplite are muscovite and fine-grained deep-blue tourmaline, the last surrounding the triplite in a crust and penetrating it along cracks and appearing as though derived from the phosphate by alteration. Much of the triplite is granular and friable from mechanical disintegration. Some black oxide of manganese occurs as an alteration product. The hardness of the mineral is around 3.5; specific gravity, 3.584. Upon analysis the results given in column I of the following table were obtained. In column II is given the composition of the triplite from Nevada.[1]

Analyses of triplite from Connecticut and Nevada.

	I.	II.
Insoluble	1.17	....
MnO	52.40	57.63
CaO	3.18	2.86
MgO	.58	1.21
FeO	4.95	1.68
P_2O_5	32.81	31.84
H_2O	.35	....
F	9.09	7.77
	104.53	102.99
Less O=F	3.83	3.27
Total	100.70	99.72

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[1] Hess and Hunt, Amer. Journ. Sci., vol. 36, p. 51, 1913.

The optical properties as determined by Dr. E. S. Larsen are as follows:

Indices of refraction:

$$\alpha=1.665,\ \pm.003.$$
$$\beta=1.673,\ \pm.003.$$
$$\gamma=1.682,\ \pm.003.$$
$$\alpha-\gamma=\ .017,\ \pm.003.$$

Optically positive (+), 2V, near 90°. Pleochroism distinct: α=pale reddish brown; β=nearly colorless; γ=very pale reddish brown.

The indices of refraction are considerably higher than are those of the Nevada material, the indices of which were found to be as follows: $\alpha=1.650$; $\beta=1.660$; $\gamma=1.672$.

This suggests that a gradual increase in the indices of refraction accompanies the replacement of manganese by iron.

The mineral is readily soluble in hot nitric or hydrochloric acid.

DATOLITE CRYSTALS FROM MERIDEN, CONNECTICUT.

In a lot of minerals collected by the writer at Meriden, Connecticut, in October, 1919, were a number of specimens of datolite. While the crystals show no new or rare forms the habit is slightly different from that of any previously figured American datolite, and since datolite from this locality has not previously been described, a short note on the occurrence is here presented.

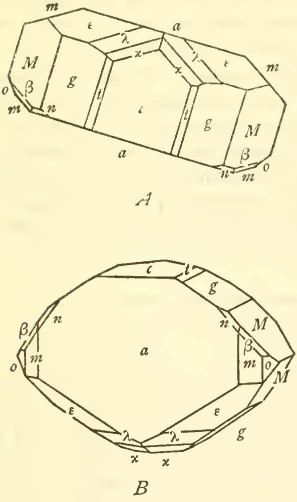

FIG. 13.—CRYSTAL OF DATOLITE. A, ORTHOGRAPHIC PROJECTION. B, CLINOGRAPHIC PROJECTION.

The quarry at Meriden is in the Middle basalt sheet and is located about 1 mile northwest of Meriden station. The rock here is all more or less amygdaloidal, and the amygdules are filled with various secondary minerals, chiefly quartz, anhydrite, chalcedony, calcite, and diabantite. The secondary minerals also occur in narrow veins, some of which persist for 50 or 75 feet, with a width of 2 or more inches. The datolite specimens were collected from such a vein on the east side of the deepest part of the quarry. The datolite was present here as a coating of crystals directly deposited on the greatly altered trap, no other mineral being associated with it. In another part of the quarry a hollow amygdule in the trap, several inches in diameter, was lined with small opaque white datolite crystals.

The crystals reach an extreme diameter of about 1 centimeter. They are colorless and rather lacking in brilliancy, so that they look like the calcite of the other parts of the quarry in color and luster and none of the specimens were identified as datolite until studied in the laboratory. The crystals on the five specimens collected are all remarkably alike in form. The habit is rather thick tabular parallel to the front pinacoid, the appearance being essentially as shown in orthographic and clinographic projection in the drawings figure 13 *a* and *b*. These crystals resemble those from Westfield, Massachusetts, except in this large development of the front pinacoid, but such tabular crystals have not been observed at Westfield.

The forms observed on the crystals are:

Pinacoids:
- *a* (100).
- *c* (001).

Domes:
- *t* (013).
- *g* (012).
- m_x (011).

Prisms:
- *m* (110).
- *o* (120).

Pyramids:
- *n* (111).
- ϵ ($\bar{1}12$).
- λ ($\bar{1}13$).
- κ ($\bar{1}15$).
- α ($\bar{1}24$).
- β (121).

a(100) is invariably the dominant form, being present as a broad and relatively smooth face, characteristically pearly in luster, as from reflection by parting or cleavage rifts parallel to this plane.

c(001) is prominent as a bright but somewhat irregular face, characteristically striated parallel to its intersection with the pyramid ϰ ($\bar{1}15$).

t(013), *g*(012) and m_x(011) are prominent faces, especially the two latter, and yield clear brilliant signals; ϰ($\bar{1}15$), λ($\bar{1}13$), and ε($\bar{1}12$) are present usually as bright small faces yielding good reflections.

m(110) is represented by small brilliant planes.

n(111) occurs only as a narrow but bright line beveling the edge *a*(100) ∧ m_x(011).

β(121) forms a narrow line beveling the angle *m*(110) ∧ m_x(011).

o(120) forms a small triangular face, which with β(121) is always etched too deeply to reflect any light at all. These dull forms were identified by their zonal relations.

α ($\bar{1}24$) occurs occasionally as a small brilliant plane beveling the edge ε ($\bar{1}12$) ∧ *g*(012).

The angles observed are given in the following table:

Angles on datolite from Meriden.

	Observed.		Calculated.	
	°	′	°	′
$a \wedge m$	33	16	32	23½
$m \wedge m$	115	7	115	13
$c \wedge \kappa$	24	58	25	19
$c \wedge \lambda$	38	15	38	16
$c \wedge \epsilon$	49	46	49	49
$c \wedge n$	67	32	66	57
$c \wedge m$	89	58	89	53
$c \wedge t$	22	41	22	52½
$c \wedge g$	32	59	32	20
$c \wedge m_x$	51	50	51	41½
$m_x \wedge m_x$	76	38	76	37

GEDRITE VARIETY OF ANTHOPHYLLITE FROM CHESTERFIELD, MASSACHUSETTS.

Under "Cummingtonite," in his work on the minerals of Old Hampshire County, Massachusetts, Prof. B. K. Emerson[1] gives the following:

> The hair-brown hornblende, so long called anthophyllite, occurs in a highly pyritous rock associated with large garnets, and can be best obtained in the bluffs west of Bunnels Pond, in Chesterfield, and from large bowlders down the hill nearly a mile southeast of Chesterfield church.

The writer in April, 1919, visited what was presumed to be the above locality, west of the pond in Chesterfield, marked Burnell's Pond on the Holyoke topographic sheet, but now locally known as Damon's Pond. In the eastern edge of a field of a deserted farm topping the first rise west of the pond a bed was found which seemed to answer Emerson's description. The bed, which is some 20 or 30 feet thick, outcrops boldly in the pasture, but nearly all of the loose portions of the rock have been hauled away in clearing the land. At the base of its outcrop this bed is made up of a coarse foliated muscovite rock containing numerous garnets which reach an extreme diameter of 3 or more inches. In color they are reddish black, of a dodecahedral form, with well-developed faces. The granular matrix is readily worked away from the crystals and fine specimens can be developed. Higher in the outcrop the garnet gives out, and the upper part of the bed is made up of a coarse aggregate of a fibrous brown material, in blades which may reach several inches in length, associated with some muscovite and a little quartz and feldspar, together with considerable amounts of a mineral pleochroic in pale brown to almost black, in thin section and apparently tourmaline. This tourmaline is unusual in that it shows in places quite well-defined cleavage parallel to the vertical axis. The rock is somewhat cavernous and rusted as from the oxidation of pyrite. Under the microscope the brown mineral is colorless except where stained by infiltrated limonite. The indices of refraction as determined by immersion are:

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[1] Bull. U. S. Geol. Surv., No. 126, 1895.

$$\alpha=1.644\pm.003.$$
$$\gamma=1.660\pm.003.$$

The elongation is positive, and in all the specimens collected the extinction is exactly parallel and not inclined. The mineral thus appears to unquestionably be anthophyllite rather than cummingtonite. A cleavage fragment was mounted on a one-circle goniometer and the cleavage surfaces were sufficiently bright to give dim, broad reflections of the signal, permitting measurements accurate perhaps to 2 degrees. A prismatic and a (*b*) pinacoidal cleavage were represented and gave the following angles:

	Observed.		Anthophyllite, Dana.	
	°	′	°	′
$m \wedge m'$ =	127	19	125	37
$m \wedge m'''$ =	53	37	54	23
$m \wedge b$ =	64	17	62	49
$m \wedge b$ =	63	2	62	49

Crystallographically and optically the numeral thus agrees with anthophyllite, although the mode of occurrence is the same as that of the cummingtonite of the type locality in the adjoining township of Cummington, and the Chesterfield bed seems to represent a continuation of the cummingtonite bed. Just what relationships exist between the orthorhombic and the monoclinic amphiboles in these beds is a subject worthy of some study. It seems not improbable that the monoclinic form is the original less stable mineral and that it is paramorphosed to anthophyllite under the influence of conditions near the surface. Upon analysis the mineral yielded the following results, the ferric oxide being probably extraneous and derived by infiltration from decomposing pyrite. The mineral is referable to the gedrite variety of anthophyllite.

Analysis of gedrite from Chesterfield, Massachusetts.

SiO_2	49. 66
Al_2O_3	6. 74
Fe_2O_3	1. 23
FeO	18. 09
CaO	3. 38
MgO	18. 62
MnO	. 05
H_2O	1. 56
	99. 33

The catalogue number of this material in the Museum collections is 93699.

AN OCCURRENCE OF THE BUCHOLZITE VARIETY OF SILLIMANITE IN PEGMATITE.

The specimens upon which the following brief descriptions are based (Cat. 93704, U.S.N.M.) were collected by the writer in the town of Russell, Massachusetts. The locality is on the Woronoco-Blandford road, about 1 mile west of the village of Woronoco, at lower Salmon Falls. The area here is occupied by a silvery mica schist known as the Goshen Schist,[1] much intruded by long, narrow dikes of a medium-grained granite pegmatite of ordinary composition devoid of conspicuous accessory minerals. At the particular point where the sillimanite occurs there are several dikes 8 inches to a foot in width, composed solely of quartz and muscovite. The sillimanite forms a sinuous sheet occupying a central suture in these dikes and varying from 1 millimeter to 2 centimeters in thickness. In other wider dikes the middle is occupied by feldspar in which the sillimanite occurs in small nodules. In still other cases a sheet of sillimanite occupies either side of a narrow dike of the quartz-muscovite rock, in contact with the inclosing schists. The sillimanite has a very finely fibrous felted structure, and is white to pale greenish in color with a silky luster. One of the most marked properties of the mineral is its extreme tenacity. Where sheets of the sillimanite occur in contact with the schists in the bed of the stream the remainder of the dike has been completely eroded away leaving a sheet of the sillimanite exposed. This sillimanite is almost entirely fresh, unaltered and unstained, and scarce abraded at all, although in a position to receive all the wear from stones carried by the torrential brook which is here a succession of waterfalls. The hardness of the sillimanite is 5; specific gravity, 3.172–3.180. Under the microscope the mineral is seen to be composed of curved and divergent aggregates of minute fibers, individually colorless but in mass yielding a brown color by dispersion probably from submicroscopic inclusions. The extinction is parallel and elongation positive. Indices of refraction, roughly maximum, 1.635; minimum, 1.629. An analysis yielded:

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[1] Emerson, B. K., Geol. of Mass. and Rhode Island, Bull., U. S. Geol. Surv. No. 597.

Analysis of bucholzite from Blandford, Massachusetts.

SiO_2	38.10
Al_2O_3	59.48
Fe_2O_3	1.05
Ignition	1.32
Total	99.95

It seems unquestionable that the sillimanite is derived from portions of the highly aluminous schist absorbed by the pegmatite materials in their upward progress. A noteworthy fact is that in this general vicinity the schist contains veins of coarse granular quartz with small amounts of muscovite and black tourmaline and abundant cyanite. These veins may well represent a phase of the pegmatite intrusion, the compound Al_2SiO_5 taking the orthorhombic form of sillimanite at a higher temperature, and assuming the triclinic form of cyanite where the temperature was below the inversion point.

STILPNOMELANE FROM NEW JERSEY.

In 1899 F. W. Clarke[1] described, as a new hydromica, a mineral collected by N. H. Darton in a trap quarry at Rocky Hill, N. J. The material is described as in minute flakes thinly matted together; color, a golden bronze with some portions slightly greenish; soft and thinly foliated; under the microscope exhibits no definite crystal form, and its optical properties, while not distinctive, suggest biotite. It is apparently biaxial, with a very small axial angle, and is pleochroic. Heated it does not exfoliate, but fuses to a dark-colored bead. Decomposed readily by hydrochloric acid.

Specimens preserved in the described material of the United States National Museum (Cat. 84735–84736), as the type of this mineral are not the original material, but were received from Washington A. Roebling, of Trenton, New Jersey. The specimens bear the original label in Roebling's handwriting, with the following inscription:

> Clarke's new hydromica; see page 71 Dana's App., under vermiculite. The result of the alteration of diabase (precisely how is this accomplished?) from Barber Ireland's Trap Quarry, Lambertville, N. J.

The specimens attracted the attention of the present writer by reason of their remarkable resemblance to the stilpnomelane and chalcodite recently described from Westfield, Massachusetts;[2] and in order to learn if the two occurrences were the same the New Jersey material was examined in some detail. The specimens consist of flat slabs of altered coarse-grained diabase, coated with a layer of soft, finely micaceous material of a golden brown color and submetallic luster. Other specimens are veins up to 2 cm. wide, bounded by slickensided surfaces and filled with a very light porous aggregate of minute scales of a dirty greenish brown color. Some specimens are so light as to float upon water. The mineral is soft, barely hard enough to scratch gypsum. Owing to its extremely porous nature the specific gravity could not be determined. Before the blowpipe it fuses with difficulty to a black magnetic slag without exfoliation. It is readily soluble in hydrochloric and sulphuric acids. Boiled in concentrated nitric acid it does not dissolve, but becomes rust brown in color. Under the microscope the material is for the most part in shreds and irregular flakes of minute size with only rarely a suggestion of hexagonal outline. Basal plates are sensibly isotropic. Sections perpendicular to the basal cleavage show birefringence colors reaching first order yellow. The mineral exhibits marked pleochroism in tones of light and dark brownish green. The mean index of refraction is about 1.63. The larger flakes are almost opaque, a condition due to a dark pigment, probably limonite. The material analyzed was from one of the greenish brown veins. While it was essentially pure, there were left behind, when the mineral was dissolved in acid, a few grains of a greenish insoluble mineral probably augite. The results of the analysis are given below together with Steiger's analysis and the mean of two analyses of stilpnomelane from Westfield. Comparison of the analysis of this mineral with that from Westfield will show that the two are identical, except that the New Jersey specimen has suffered more oxidation than that from Massachusetts. Extreme susceptibility to oxidizing influences is one of the most marked characteristics of stilpnomelane, the mineral readily passing over into an indefinite, wholly ferric pseudomorph, known as chalcodite, which is of uncertain composition, a part at least of the iron being present as limonite. The change is accompanied by a considerable increase in the index of refraction, and also by a decrease in the percentage of constitutional water with a greater increase in hygroscopic water. The low water content of the present material may be due to loss of hygroscopic water during the years it has been preserved in a drawer in the collections.

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[1] Clarke, F. W., and Darton, N. H. On a hydromica from New Jersey, Amer. Journ. Sci., vol. 7, p. 365, 1899.

[2] Shannon, E. V. Diabantite, Stilpnomelane, and Chalcodite of Westfield, Massachusetts, Proc. U. S. Nat. Mus., vol. 57, p. 397.

Analyses of stilpnomelane from New Jersey and Massachusetts.

	I.	II.	III.
SiO_2	45. 12	44. 08	40. 24
Al_2O_3	6. 29	4. 74	10. 34
Fe_2O_3	23. 67	5. 27	24. 57
FeO	5. 93	23. 31	5. 21
MgO	9. 36	8. 36	6. 78
MnO	Trace.	. 87	....
CaO	Trace.	Trace.	....
K_2ONa_2O	Trace.	Trace.	2. 20
H_2O–110	9. 12	2. 21	3. 03
H_2O+110		10. 28	7. 63
Total	99. 49	99. 82	100. 00

I. Stilpnomelane (var. chalcodite) Lambertville, N. J., analyzed by Shannon.

II. Stilpnomelane, Westfield, Mass., average of two analyses by Shannon.

III. Hydromica, Rocky Hill, N. J. Clarke. Analyzed by Steiger; impurities deducted.

The differences between the two analyses of the New Jersey mineral are not great enough to cause surprise when the nature of the material is considered. It seems possible from the description that the specimen described by Clarke may have contained impurities other than the 18.51 per cent calcite and 0.24 per cent titanium dioxide thrown out before recalculation. The alkalies may represent a small amount of feldspar or of a zeolite present as impurity, and a small admixture of diabantite would be impossible of detection by other means than measurements of refractive index. There thus appears no valid reason for regarding the mineral as other than a partly peroxidized stilpnomelane.

Persons familiar with this mineral, and especially New Jersey collectors, have been accustomed to refer to it by a specific name after its discoverer. So far as the writer has been able to learn the substance is not referred to by this name in the literature and printing it has been scrupulously avoided in order to keep it free, as it ethically now is, to be applied at some future time to a worthier species.

TWO NEW GENERA AND SPECIES OF ACANTHOCEPHALOUS WORMS FROM VENEZUELAN FISHES.

By H. J. Van Cleave,
Of the University of Illinois, Urbana, Illinois.

With the exception of the species parasitic in birds and in mammals, practically nothing is known of the acanthocephalan fauna of South America. K. M. Diesing (1851) described a number of species of these parasites from the Brazilian collections by Natterer and by Olfers which included a few species from fishes. These were briefly characterized by the enumeration of a few salient features of external morphology. The drawings accompanying these descriptions are so highly generalized that they add but little to the data available for the recognition of Diesing's species. In spite of the fact that his records indicate some interesting deviations from the conditions and structures found in the better known European and North American species, no one has yet made a successful attempt to include his forms from fishes in the modern system of classification which, for this group, has been evolved in the last quarter century.

No recent worker has published an account of having restudied or even of having recognized any of Diesing's species of Acanthocephala from Brazilian fishes. In fact, there is no published record including results of a careful study of the Acanthocephala from fresh-water fishes of any locality on the South American continent. Porta (1905) in his general catalogue of the Acanthocephala of fishes listed Diesing's species, but with no data beyond that included in the original descriptions. Recently a considerable body of evidence has been accumulating (Van Cleave 1916 *a*: 228, 1918: 20 and 32, 1919: 234) emphasizing the distinctive features of the North American acanthocephalan fauna as contrasted with the European fauna, upon which the modern system of classification of the group has been chiefly based. It is not improbable that the incompletely described and imperfectly known novelties in Diesing's work may represent another line of independent differentiation characteristic of the Acanthocephala of the South American continent. Phylogenetically the Acanthocephala represent such an ancient group of parasites that great diversification in isolated regions is not surprising.

Through the courtesy of Prof. A. S. Pearse I have been permitted to study an interesting collection of Acanthocephala which he secured in the course of investigations upon the fishes of Lake Valencia, Venezuela, during the summer of 1918. Though data from a fairly large number of fishes was included in this collection, but two species of these parasites were encountered. For one of these, two species of fresh-water fishes acted as definitive hosts, and for the other five species of definitive hosts were recorded. Since each of the parasites here encountered represents a hitherto undescribed genus, it seems advisable to present descriptions of them. This is especially desirable because facts brought out in the study of these new forms seem to present entirely new lines of evidence concerning the relationships of certain genera previously described, and also because it has been found necessary to create a new family for which one of these genera becomes type.

This paper forms No. 157 of the series of contributions from the Zoological Laboratory of the University of Illinois.

PANDOSENTIS, new genus.

Generic diagnosis.—With the characters of the family Neoechinorhynchidae, except for the variation in arrangement of giant nuclei within the subcuticula. These do not always lie in the sagittal plane, as in representatives of all the other genera previously included in this family, but are frequently lateral in distributon. Parasitic as adults in the alimentary canal of fishes. Body proper small, devoid of spines. Proboscis short, cylindrical, provided with more than three circles of hooks. Boundary between root and thorn usually not sharply marked. Male genital organs in same arrangement as found in members of the genus *Gracilisentis.* Testes elliptical, contiguous. Cement gland a rounded syncytial mass immediately following the posterior testis, with its posterior boundary indented for the reception of the reservoir of the cement gland. Cement gland in only known species contains 16 giant nuclei. Central nervous system at base of proboscis receptacle. Retractors of receptacle emerge from the receptacle at its posterior extremity on dorsal and ventral surfaces. Lemnisci not as long as the proboscis receptacle.

Type species.—Pandosentis iracundus, new species.

PANDOSENTIS IRACUNDUS, new species.

Plate 27.

Specific description.—With the characters of the genus *Pandosentis.* Females about 1 to 1.5 mm. long and 0.4 mm. in maximum diameter; males about 0.6 to 1 mm. long and 0.15 to 0.25 mm. in diameter. Body proper tapering slightly toward each extremity (fig. 6), frequently with the ventral surface slightly concave. Proboscis short, cylindrical; in most preserved specimens completely inverted and retracted within body proper by the violent action of the exceptionally highly developed invertor of the proboscis and the retractors of the receptacle. In fully extended individual the proboscis (fig. 1) measured 0.09 mm. in length and was of the same diameter. Proboscis bears 22 longitudinal rows of four hooks each. Each hook is embedded in a papilla beyond which only a small portion of the hook protrudes. Hooks of distinctive form, somewhat resembling those of *Gracilisentis*, with no distinct line of separation between thorn and root and with no sharp contrast in form of hooks in different regions of the proboscis. Total length of line connecting base of root with tip of hook when hook is in full side view, 14μ. The exposed, distal, 8μ of each hook near the base of the proboscis is bent at almost right angles to the basal portion of the hook (fig. 2), while those at the tip of the proboscis (fig. 4) are slightly less strongly bent. Wall of proboscis receptacle very delicate, composed of a single layer. Invertor of the proboscis excessively developed, filling most of the space within the receptacle (fig. 5). Central nervous system a small mass of ganglion cells crowded into the posterior extremity of the receptacle between the posterio-lateral angles of the receptacle where the retractors of the receptacle emerge from the wall. Lemnisci shorter than the receptacle and usually obscured by that structure. Embryos (fig. 9) within the body cavity of the mature female 22 to 28μ long by 11μ in diameter. Testes ovoid to spheroidal, contiguous; followed immediately by a syncytial cement gland containing 16 giant nuclei.

Type host.—*Aquidens pulcher* (Gill); also taken from intestine of *Crenicichla geayi* Pellegrin. These hosts were identified by Prof. C. H. Eigenmann.

Type locality.—Maracay, Lake Valencia, Venezuela.

Cotypes deposited in the collection of the writer and in the United States National Museum.

The members of this genus are of especial interest because of the fact that they show remarkable combinations of characters, which indicate probable relationships to the two distinctly North American genera, *Gracilisentis* and *Tanaorhamphus*. In many respects the characters of *Pandosentis* stand intermediate between those of the two genera just mentioned. General body form and general topography of the internal organs of both male and female closely simulate the conditions found in *Gracilisentis*, though the number of giant nuclei in the cement glad is 16, the same as that found in *Tanaorhamphus*, as against the 12 found in *Gracilisentis*. The form of the proboscis and the number and shape of the hooks combine characters which seem, on the whole, to stand intermediate between these two genera, as shown in the accompanying table:

Genus.	Proboscis hooks.		Nuclei in cement gland.
	Circles.	In a circle.	
Gracilisentis	3	12	12
Pandosentis	8	11	16
Tanaorhamphus	20	8–10	16

The lacunar system of *Pandosentis* is especially conspicuous in many individuals; in fact, the distances between the annular lacunae in the body wall are frequently little more than the diameter of a single lacuna (fig. 7). The body wall is only about 50μ in thickness. This gives to the individuals a distinctly fragile appearance. The nuclei of the subcuticula are of the type previously described for *Gracilisentis.* The unusual irregular distribution of the dorsal subcuticular nuclei mentioned in the generic diagnosis is associated with the fact that the lacunar system is not absolutely regular in its arrangement of parts. In some portions of the body there are distinctly dorsal and ventral main canals with regular annular intercommunications between them. This is especially typical of the anterior region of the body. Figure 7 represents a portion of the dorsal lacuna and its lateral branches from the anterior extremity of the body. In other regions of the body (fig. 8) this definiteness of arrangement is replaced by irregular diagonal canals communicating with the annular lacunae. The giant nuclei of the subcuticula have definite relationships to the lacunar system. In most of the Neoechinorhynchidae the longitudinal trunks of this system are distinctly dorsal and ventral in location. In all such cases which have been observed by the writer, the giant nuclei are all located in the sagittal plane of the body. In *Pandosentis* the irregularity of the longitudinal trunks of the lacunar system is directly associated with an irregularity in arrangement of the subcuticular nuclei. Figure 8 shows one of the giant nuclei from the posterior extremity of a mature male. The irregularity of the lacunar system in this region is readily observable.

In working out the morphology of this species nearly 100 specimens were studied. Of these only three or four had the proboscis sufficiently protruded to make a study of the hooks and their arrangement possible. Inversion of the proboscis is due to the action of the strongly developed invertor of the proboscis, which, in this species, is one of the most conspicuous structures in the anterior region of the body. It is conspicuous even in toto mounts, and in the extended proboscis occupies much of the interior of that organ. There are three conspicuously large nuclei in this invertor muscle (fig. 5).

The retracted proboscis and the invertor leave little room for other structures within the interior of the proboscis receptacle. The form and structure of this last-mentioned organ differ considerably from those of other members of this same family. The posterior end of the receptacle is bluntly truncated, and from the dorsal and ventral margins of this posterior surface the retractors of the receptacle emerge (fig. 5). The central nervous system, a single ganglionic mass, lies against the posterior wall of the receptacle between the points of emergence of the retractors. The ganglion is about 60μ in diameter. In other species of Neoechinorhynchidae the wall of the receptacle is composed of a single heavy muscular layer, the fibers of which are directed perpendicularly to the surface of the receptacle. In *Pandosentis iracundus* the wall of the receptacle is extremely thin and devoid of any conspicuous development of musculature. The dorsal and ventral retractors of the receptacle extend through the body cavity to the dorsal and ventral surfaces of the body wall, respectively, and find their insertion in the immediate vicinity of the giant nuclei of the subcuticula.

Seven species of fish were found to harbor Acanthocephala in the immediate vicinity where *Pandosentis iracundus* was found, yet only two host species are recorded for this parasite. Of these two, *Aquidens pulcher* (Gill) was much the more heavily parasitized. Though all of the collections of this species were made within the limits of one week none of the females taken from *Aquidens pulcher* contained fully formed hard shelled embryos such as were found in some of the individuals from the much less heavily parasitized host, *Crenicichla geayi.*

QUADRIGYRUS, new genus.

Generic diagnosis.—Acanthocephala of medium size parasitic in the alimentary canal of fishes. Proboscis armed with four circles of hooks. Anterior surface of body usually provided with four circles of cuticular spines. Subcuticular nuclei of two types; those of anterior part of body ovoid giant nuclei, dorsal and ventral in location; those in remainder of body a large, central elongated mass, from which heavy lateral projections are given off, usually lateral in distribution. Proboscis receptacle provided with a single heavy muscular wall. Central nervous system located at posterior extremity of proboscis receptacle.

Type species.—Quadirgyrus torquatus, new species.

QUADRIGYRUS TORQUATUS, new species.

Plate 28.

Specific description.—Preserved individuals long, cylindrical, with a short globose proboscis; gravid females frequently showing an ovoid enlargement of the anterior extremity. Mature females 10 to

20 mm. long and 0.9 to 1.25 mm. in maximum diameter. Mature males about 8 to 10 mm. long, with a maximum diameter of about 0.6 mm. Anterior region of body provided with four circles of cuticular spines which are approximately 24μ in length. Proboscis provided with four circles of five hooks each, those of terminal and second circle similar in appearance and size and fairly sharply differentiated from those of third and basal circles. Terminal hooks 94 to 106μ long, with a root 47 to 53μ long; those of second circle 76 to 100μ long, with a root 47 to 53μ long; those of third circle 53 to 59μ long, with a root 24 to 30μ long; basal hooks, 41 to 47μ long, with inconspicuous roots 12 to 24μ in length. Lacunar system an irregular system of branching canals. Subcuticular nuclei of two types; those in anterior extremity ovoid giant nuclei; those in posterior part of body, each in the form of a central elongated mass, from which short lateral branches are given off. Anterior nuclei, one dorsal and one ventral. Remaining nuclei lateral in arrangement, usually one upon the left and two upon the right side of the body. Proboscis receptacle inclosed by a single muscular wall. Central nervous system a single ganglion, near posterior end of receptacle. Testes elliptical to spindle shaped, usually considerably separated from each other. Cement gland a long compact mass containing a few large nuclei. Female genital orifice on ventral surface of the body a short distance from the posterior tip (fig. 19). Posterior extremity of body beyond genital orifice of distinctly smaller diameter than remainder of body.

Type host.—*Hoplias malabaricus* (Bloch). Also taken from the following hosts: *Symbranchus marmoratus* Bloch, *Crenicichla geayi* Pellegrin, *Gephyrocharax valenciae* Eigenmann, and *Astyanax bimaculatus* (Linnaeus). Identified by Prof. C. H. Eigenmann.

Type locality.—Maracay, Lake Valencia, Venezuela. Also taken at Isla del Buro, Venezuela.

Cotypes in the collection of the writer and in the United States National Museum.

The description of this species is based upon a study of numerous individuals from various hosts, all collected during the month of August, 1918. They represent widely different conditions of maturity, ranging from fully mature individuals to much smaller specimens, in which the sexual products are not yet differentiated. This diversity of conditions has offered exceptional opportunity for the complete study of the finer features of the morphology from stained toto-mounts, for many structures, partially obscured in the gravid females, have been readily demonstrable even in these same individuals after the general nature of the structures had been determined from a study of smaller, less fully developed specimens.

The degree of infestations of individual hosts varied widely. Even in *Hoplias malabaricus*, the type host of this species, infestations ranged from a single parasite to more than 50 individuals in the same host specimen. No extremely heavy infestations were encountered.

The position of the genus *Quadrigyrus* in the classification of the Acanthocephala is not easily determined. This is true in spite of the fact that characteristics commonly considered as of value in establishing generic relationships are clearly observable in members of this genus. The difficulty arises from the fact that these characters appear in combinations which have not been observed previously in other genera. In the genera and families of Acanthocephala created by Hamann (1892), and in the later work by Lühe (1911), certain groups of characters seemed so commonly associated that groups rather than individual characters have come to be considered by taxonomists as immutable units forming the basis of a natural classification. The early families were based on a single genus each and the genera were frequently monotypical, consequently it is not surprising that the addition of new facts regarding Acanthocephala from other parts of the world should bring together new groupings of characters different from those of the genera and families included in the narrowly restricted regions considered by the early workers.

Thus, the presence of a single muscular wall surrounding the receptacle of the proboscis was considered as peculiar to the Neoechinorhynchidae until the present writer (1916*a*) described several species of Centrorhynchidae belonging to the genus *Mediorhynchus*, each of which displayed a single-walled receptacle. Now, with the discovery of the genus *Quadrigyrus*, another addition is made to the forms having a single-walled proboscis receptacle, and this character may no longer be in itself considered as diagnostic for the Neoechinorhynchidae.

In the following discussion of relationships the writer has followed the current usage of including the subfamily Rhadinorhynchinae within the family Echinorhynchidae. As it stands, this family has little homogeneity, representing a residual group from which the other families have been detached in much the same manner as its type genus, *Echinorhynchus*, represented at one time the only genus recognized among the Acanthocephala. Many of the species attributed to *Echinorhynchus* have remained there because of insufficient data to enable later workers to recognize the genus to which the species properly belong. A number of slightly related genera still remaining in this family present charactertistic differences of what seem to be of family significance. Conservatism has prevented workers in this group from creating new families for these single genera, many of which are only imperfectly known. It is believed that the relationships of the forms now considered as belonging to the Echinorhynchidae may be better understood and more intelligently dealt with when greater numbers of genera have been discovered through researches upon the parasites of regions which have been practically unstudied.

The presence of four circles of proboscis hooks in *Quadrigyurus* is a rather significant feature in that it marks a transition between the condition of three circles characteristic of many species of the Neochinorhynchidae and the condition of many circles such as are characteristically found in the genus *Rhadinorhynchus* and many others. Lühe (1904:191) has called attention to the fact that in members of the genus *Neoechinorhynchus* the hooks usually considered as belonging to the terminal circle do not all occur at the same level upon the surface of the proboscis, but rather represent two alternating series or circles of three hooks each, but slightly separated one from the other. Phylogenetically it seems probable that a condition such as that mentioned by Lühe, and the fusion of two circles at the base of the proboscis (Van Cleave, 1919:238), as in *Pomphorhynchus bulbocolli*, may represent either an early step in the diversification which has resulted in the development of the highly armed, elongated proboscis from a simple type, or may, on the other hand, represent a late stage in the regressive simplification of the elongated type of proboscis toward the simple ovoid type. These two possibilities of interpretation are mentioned here because of the fact that investigators have apparently been agreed in defining the simplicity of the Neoechinorhynchidae as primitive when there is just as much reason for believing that it is a simplicity derived from a regressive evolution. Regardless of the interpretation that is put into the evidence it nevertheless holds that the four circles of hooks on the proboscis of *Quadrigyrus* represents a condition intermediate between the fixed three circles characteristic of many Neoechinorhynchidae and the many circles found in most of the other Acanthocephala. In this degree *Quadrigyrus* represents a transitional form linking the Neoechinorhynchidae with the other genera.

To the present time members of the subfamily Rhadinorhynchinae have comprised the only Acanthocephala possessing body spines which occur as adults in fishes. This would suggest a probable relationship between the Rhadinorhynchinae and members of the genus *Quadrigyrus*. In details of structure the body spines in the two instances differ considerably. Those of *Quadrigyrus* have a less conspicuous cuticular elevation surrounding each spine, and at the base of each there is a distinctly granular area which renders the boundary between the base of the spine and the subcuticula rather indistinct in toto-mounts. In young individuals (fig. 10) the spines are easily observable, but in many of the fully mature specimens the body spines can be demonstrated in toto-mounts only with greatest difficulty. In fact, in some individuals they seem to be wanting and their place marked only by a roughening of the body surface. This condition is not peculiar to members of this genus, for the same thing has been noted by the writer in describing mature females of *Filicollis botulus* (Van Cleave, 1916: 132).

The subcuticular nuclei of *Quadrigyrus* are unique, both in form and in arrangement. Ovoid or elliptical giant nuclei of fixed number and arrangements are characteristic of the Neoechinorhynchidae. Finely dendritic nuclei are characteristic of *Echinorhynchus thecatus* and what seem to be very minute scattered nuclei have been frequently described in the subcuticula of various genera of Acanthocephala. In *Quadrigyrus* nuclei of two distinctly different types occur. In the anterior region of the body a single elliptical giant nucleus is to be found in the subcuticula on the ventral surface of the body, and directly opposite it on the dorsal surface of the body there is another one just like it. The remainder of the subcuticular layer contains a few large nuclei laterally arranged. Each of these consists of an elongated central mass, from which a small number of short heavy projections are given off. These branches follow the canals of the lacunar system for a short distance and end abruptly or in a short pointed projection. These nuclei last described are different from any that have heretofore been recorded from any acanthocephalan.

From the foregoing discussion it will be seen that the genus *Quadrigyrus* has certain definite points in common with the Neoechinorhynchidae, on the one hand, and with the Rhadinorhynchinae, on the other. These relationships are briefly recapitulated in the following table:

Name.	Body spines.	Wall of proboscis receptacle.	Location of brain.	Circles of hooks.
Neoechinorhynchidae	Wanting	Single	Base of receptacle	3+
Quadrigyrus torquatus	Four circles	...do	Near base of receptacle	4
Rhadinorhynchinae	Many circles	Double	Middle of receptacle	Many.

Even this partial summary of comparisons will show that it is impossible to include *Quadrigyrus* in either of the two groups mentioned above; and since its affinities with other Acanthocephala are much less obvious it becomes necessary to create for this genus a new family, which takes the name Quadrigyridae and of which the genus *Quadrigyrus* becomes type.

QUADRIGYRIDAE, new family.

Acanthocephala of medium size parasitic as adults in the alimentary canal of fishes. Anterior body region provided with cuticular spines. Proboscis receptacle enclosed by a single muscular wall. Central nervous system located near the base of the receptacle. Subcuticular nuclei in anterior region elliptical, in sagittal plane; in remainder of body a few large, branched nuclei, laterally arranged.

SUMMARY.

1. A collection of Acanthocephala taken by Prof. A. S. Pearse from fishes of Lake Valencia, Venezuela, contains two new species, each of which represents a new genus and one of them a new family.
2. *Pandosentis*, new genus, is described and *P. iracundus*, new species, is designated as type. *Aquidens pulcher* is the type host.
3. The relationships of the genus *Pandosentis* are discussed.
4. *Quadrigyrus*, new genus, is described and *Q. torquatus*, new species, is designated as type. *Hoplias malabaricus* is the type host.
5. The relationships of the genus *Quadrigyrus* are discussed and a new family, the Quadrigyridae, is established with *Quadrigyrus* as the type genus.

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EXPLANATION OF PLATES.

All figures were drawn from hematoxylin stained permanent mounts with the aid of a camera lucida.

SYMBOLS.

a, annular lacuna.
a r, retractor of anterior region of body.
b, central nervous system.
c, cement gland.
d, dorsal lacuna.
d r, dorsal retractor of receptacle.
e, egg mass.
g, genital opening.
i, invertor of proboscis.
l, lemniscus.
n, subcuticular nucleus.
r, proboscis receptacle.
s, body spine.
t, testis.
v r, ventral retractor of receptacle.

PLATE 27.

Pandosentis iracundus, new species.

The scales indicating magnification of figs. 1, 5, 7, and 8 have a value of 0.05 mm.; of fig. 6, 0.1 mm.; of remaining figures on this plate, 0.01 mm.

FIG. 1.—Fully extended proboscis of a mature male from intestine of *Aquidens pulcher*.
2.—Lateral view of a hook from near base of proboscis of a mature female.
3.—Lateral view of a hook from near middle of proboscis.
4.—Lateral view of a hook from tip of proboscis.
5.—Optical section through anterior region of a young female showing proboscis receptacle and associated structures.
6.—Optical section of a mature male with proboscis inverted.
7.—A portion of lacunar system in dorsal anterior region of a male, showing irregularity in the dorsal lacuna.
8.—A portion of lacunar system from posterior region of same individual as shown in fig. 7, showing irregularities of lacunar system in the region of a subcuticular giant nucleus.
9.—An embryo from the body cavity of a gravid female.

PLATE 28.

Quadrigyrus torquatus, new species.

The scales indicating magnification of figs. 11 to 15, inclusive, have a value of 0.01 mm.; all others on this plate have a value of 0.1 mm.

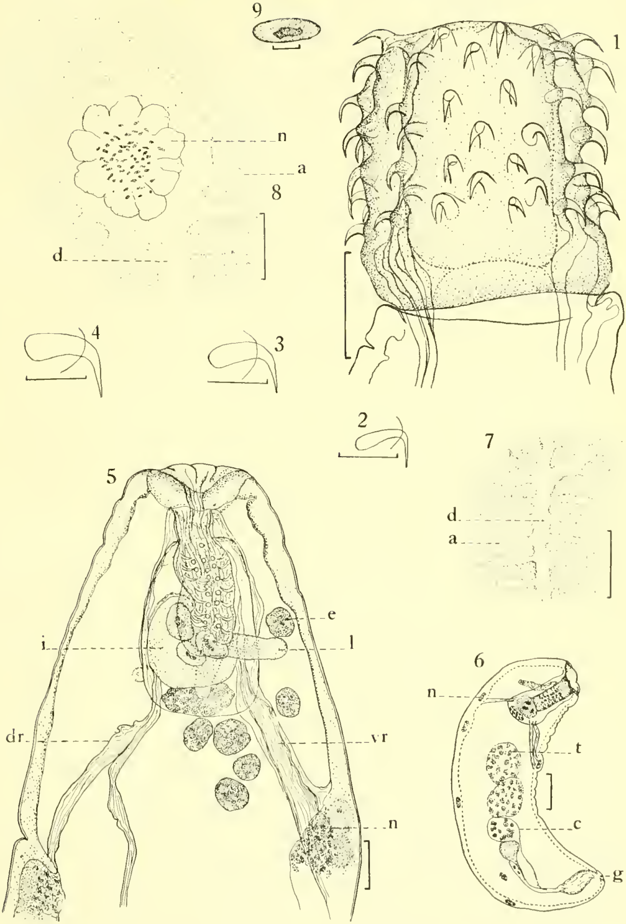
FIG. 10.—Fully extended proboscis and anterior region of body of a young male showing arrangement of proboscis hooks and body spines.
11.—Hook from basal circle of proboscis of young female.
12.—Hook from third circle of proboscis, same individual.
13.—Hook from second circle of proboscis, same individual.
14.—Hook from terminal circle of proboscis, same individual.
15.—Longitudinal section of an embryo from the body cavity of a gravid female.

FIG. 16.—Optical section through anterior extremity of a young male, showing details of the receptacle and its associated structures.

17.—A portion of the body wall in the region of one of the lateral nuclei, showing the relation between the size of the nucleus and the width of the animal and the relations of the nucleus to the lacunar system. From a young male.

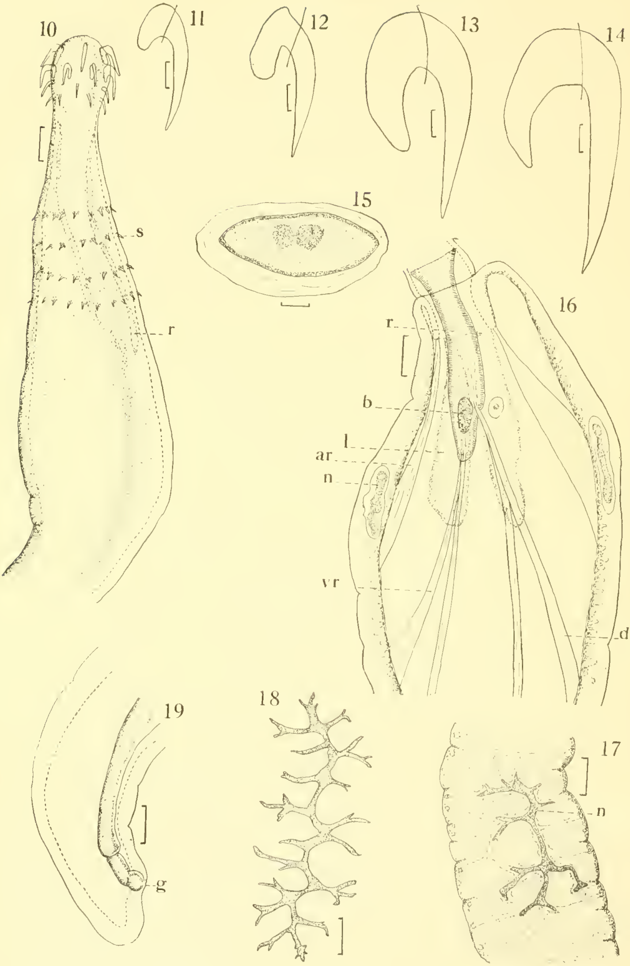
18.—A nucleus similar to the one shown in preceding figure but from a larger, older female.

19.—Posterior extremity of a young female in optical section, showing subterminal location of genital opening.



PANDOSENTIS IRACUNDUS, A NEW SPECIES OF ACANTHOCEPHALOUS WORMS.

FOR EXPLANATION OF PLATE SEE PAGE 465.



QUADRIGYRUS TORQUATUS, A NEW SPECIES OF ACANTHOCEPHALOUS WORMS.

FOR EXPLANATION OF PLATE SEE PAGES 465 AND 466.

A NEW POLYCHAETOUS ANNELID OF THE GENUS NEREIS FROM BRAZIL.

By Aaron L. Treadwell,
Vassar College, Poughkeepsie, New York.

The following description is of a *Nereis* collected at Santos, Brazil, in July, 1913. It was transmitted to the United States National Museum by the director of the Museu Paulista, Sao Paulo, Brazil, and by them sent me for identification.

NEREIS BREVICIRRATA, new species.

The collection contained two entire specimens of adult females with eggs. The length was about 30 mm. with a peristomial width of 3 mm. The only trace of color in the alcoholic material was a brownish tint, forming a fairly uniform shading on the anterior region as far back as the fifth somite. Behind this the color is limited to a darker brown median band, which at somite 12 narrows and becomes very indistinct for the remainder of the body. In the preserved material the dorsal blood vessel shows as a prominent narrow stripe.

The prostomium (fig. 1) is very slightly rounded anteriorly, the width at the anterior margin being practically equal to that just in front of the anterior eyes. A median longitudinal dorsal groove extends from the anterior margin to the level of the anterior pair of eyes. The entire lateral margin of the prostomium is fused with the inner face of the palp, though as far back as the anterior pair of eyes a faint groove marks the line of fusion. Behind this point the fusion is complete. The tentacles are separated at their bases by a distance equal to their diameter, and are relatively small, conical, with acute tips. The palps are very thick and fleshy, as broad as the peristomium, with a very small terminal joint. Toward the end a transverse groove simulates an articulation.

The tentacular cirri are small, most of them not reaching the apex of the palp. The posterior dorsal one is the most slender, and extended in one specimen as far as the posterior border of somite 2, while in the other it was much shorter. This is evidently a variation due to the preservation. The other cirri are not more than a third as long as this, conical, with acute tips (fig. 1).

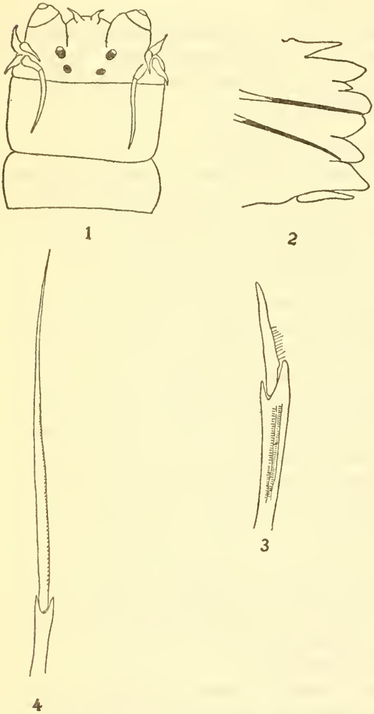
The peristomium is longer than the prostomium, and shorter than the second and third somites combined, though longer than the second. Toward the posterior end of the body there is a gradual decrease in the diameter. There is one pair of long, slender anal cirri.

There are two pair of eyes, not noticeably different in size, the anterior being a little farther apart than the posterior and with much more prominent lenses.

The jaws are rather large, broad-flattened plates much curved toward the ends. Each has a row of denticulations along the inner edge. They are light brown at the base, but much darker toward the apex. The paragnaths are small, dark brown in color: I, two small ones lying one behind the other; II, a cluster of about 7; III and IV, apparently run together, the two being represented on either side by a patch of about 15; V, two oval paragnaths larger than the others; VI, three, almost continuous with the basal armature, which extends entirely around the pharynx.

The parapodia are of practically uniform character throughout the body. The tenth (fig. 2) shows all lobes of practically the same length, none very long or sharp pointed. The dorsal cirrus is conical, the ventral one much more slender, attached rather closely to the neuropodium.

Two kinds of compound setae occur in the notopodium and only one in the neuropodium. One (fig. 3) has a stout basal portion with many transverse striations; the terminal joint small, blunt pointed, with a row of stout spines along one edge. These spines vary in number and size, but this variation is, I think, due to the loss or injury of some of them. The second form of seta (fig. 4) has a slender basal joint, the terminal joint being very long and slender. There is a faint indication of striations along one margin. Both forms occur in the notopodium, but only the latter in the neuropodium.



Figs. 1-4.—Nereis brevicirrata, new species. 1, Head × 7.5; 2, Tenth parapodium × 22.5; 3, Compound seta × 250; 4, Compound seta × 300.

Type.—Cat. No. 18934, U. S. N. M.

SOME MINERALS FROM THE OLD TUNGSTEN MINE AT LONG HILL IN TRUMBULL, CONNECTICUT.

By Earl V. Shannon,

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INTRODUCTION.

The locality of Long Hill in Trumbull, Connecticut, is situated on the Danbury branch of the New York, New Haven, & Hartford Railroad, about 9 miles north of Bridgeport. The place where tungsten mining has been carried on has been described by Hobbs,[1] whose report has been used freely in the preparation of the following notes. The tungsten minerals, scheelite and wolframite, have been known to occur here since an early date, and the locality became especially renowned because of the excellent pseudomorphs of wolframite after scheelite which were occasionally found. Desultory minings for materials for porcelain manufacture and for quartz for use as a wood filler have been carried on, and a short time before Hobbs's visit a corporation was formed to exploit the tungsten ores. This venture seems to have been exceedingly ill-advised, and large amounts of money were spent in opening great quarrylike mine pits, from which many tons of rock were mined and milled to secure a few tons of lean tungsten ore. An expensive mill was built, the design of which was wholly impractical. This mill has since been destroyed by fire. The persons in charge of the tungsten mine were seemingly quite unacquainted with modern mining practice, and, despite the large amount of work done, little is known regarding the extent or value of the tungsten deposits.

The present writer visited the now deserted mine in October, 1919, and collected a suite of representative specimens for the United States National Museum. Although a careful search failed to discover any tungsten ores, a number of interesting minerals were procured. Some of these have been further investigated in the laboratory and are described in detail below.

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[1] Hobbs, William Herbert, The old tungsten mine in Trumbull, Conn., 22nd Ann., Rept., U. S. Geol. Survey, pt. 2, pp. 13–22 ,1902.

The low hill on which the tungsten mine is located consists of a flat lying bed of crystalline limestone, approximately 40 feet in thickness, between beds of hornblende schist. The scheelite and wolframite are reported to have occurred in a quartz layer at the lower contact of the limestone, and to have represented a contact metamorphic deposit. Hobbs regards the hornblende schist as being an altered diorite, but Hess[1] states that it may be altered volcanic tuff. It bears considerable resemblance to the amphibolite of Chester, Massachusetts. The limestone is thinly laminated white crystalline marble, containing bedded lines of metamorphic minerals throughout. These are the characteristic minerals of regionally metamorphosed limestones throughout the Taconic region rather than minerals of true contact origin. Recognizable contact metamorphism traceable to visible igneous masses is absent. The main opening of the mine is at the site of the burned mill near the railroad. This is a large quarry, exposing the whole width of the limestone bed. The lower contact of this bed is covered by water in the bottom of this pit, but is well exposed at the north end of the opening. The lowest bed of the limestone is here much stained by limonite, and is somewhat porous from leaching. Narrow quartz veins up to a foot in width penetrate this bed from below, and break up and die out soon after entering the limestone. This lowest rust stained limestone bed contains much marcasite in disseminated form and as veins up to 2 inches in width. The quartz veins contain mica of the margarodite variety, topaz, and a very black sphalerite. No scheelite or wolframite was found, although these minerals might be expected in this association. In the bottom of the main pit a dike of ordinary granite pegmatite rich in feldspar and biotite is exposed. An old tramway leads up around the north side of the hill for a thousand feet to the "Upper Mine," also located at the base of the limestone bed. Here little can be learned as to the geologic structure or the nature or occurrence of the ore, as the pit is filled with water. The walls are crumpled and cut by small faults, and the rock is much weathered and stained with limonite. Below the tramway, midway between the lower and upper openings, is the "Champion lode." This is a vein, apparently consisting of pure vitreous quartz which was mined for wood filler. The vein which was from 4 to 6 feet wide has perfectly smooth and almost vertical walls. About 800 feet due south of the upper mine opening is a small pit, from which marble has been quarried and burned to quicklime. The marble, like that of the main pit, is thin bedded and rather impure from the presence of metamorphic silicates. Some of it is distinctly pink, while other portions are gray, with large calcite grains in a finer ground mass, giving the rock a porphyritic appearance. About 150 feet southeast of the limekiln a trench has been dug some 75 feet on a quartz-topaz vein, which is referred to as the Limekiln Vein in the following descriptions. Numerous other shallow pits and trenches have been dug, but those examined by the writer showed no minerals of unusual interest. The minerals occurring in the vicinity of Long Hill are described below:

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[1] Hess, Frank L., Tungsten minerals and deposits. Bull. U. S. Geol. Survey No. 652, p. 41. 1917.

SCHEELITE.

Previous writers have described the scheelite as nearly white in color and occurring in quartz with epidote, hornblende, and marcasite, in the form of well-defined tetragonal pyramidal crystals an inch or more in diameter, and as masses sometimes several pounds in weight, loosely imbedded in the matrix. No scheelite was found by the present writer.

WOLFRAMITE.

Wolframite at this locality occurred under the same conditions as scheelite, being in all cases pseudomorphous after the lime tungstate and preserving its crystal form. These specimens are no longer obtainable at the locality. The pseudomorphs are said to have been found only in portions of the ledge which were weathered and iron stained. An excellent suite of these pseudomorphs is preserved in the Brush collection of Yale University.

TUNGSTITE.

Tungstic ocher occurred rarely as a thin yellow coating on quartz. It was not abundant and is not now obtainable.

MARCASITE.

Marcasite, more or less weathered, is abundant in the upper mine opening and in the north end of the lower opening. Here it occurs in granular masses and also as internally fibrous mammillary crusts a half inch in thickness on the walls of narrow open cracks in the lower limestone bed. It is very prone to oxidize under the action of the weather, and most of the abundant ocherous limonite stains present have come from its alteration.

SPHALERITE.

A brilliant coarse granular and very black sphalerite occurs in aggregates up to 3 inches in diameter in the narrow quartz-topaz veins in the main pit, especially where these veins cut the marcasite layer at the north end of the pit. The sphalerite, which upon weathering assumes an iridescent tarnish, occurs in vitreous grayish quartz associated with margarodite, margarite, and topaz. The sphalerite was not seen in contact with the topaz, although occurring in the same hand specimen with it. The sphalerite is easily confounded with wolframite, which it greatly resembles. Its streak is dark brown, and when the powder is examined under the microscope it is seen to be very dark brown in color, transparent, and wholly isotropic.

GARNET.

Brownish red granular garnet occurs both in the main pit and in the limekiln opening in nodular or lenticular masses in marble which may reach a foot in greatest diameter. Where such masses have had the surrounding calcite dissolved away small dodecahedral crystals are revealed.

PYROXENE.

The green granular pyroxene, coccolite, occurs in the main pit and especially in the limekiln pit in grayish green grains distributed in lines parallel to the bedding. It is to this mineral that the marble owes much of its banded appearance. White malacolite occurs sparingly in the marble. These minerals are of the types common throughout the Berkshires and warrant no special description.

PHLOGOPITE.

Phlogopite occurs sparingly as small copper-red scales in the marble of the limekiln opening.

TOURMALINE.

Some large blocks on the dump of the main pit are composed of fine acicular black tourmaline embedded in vitreous grayish quartz.

HORNBLENDE.

A common green hornblende occurs with coccolite and under the same conditions in the limestone.

FLUORITE.

Fluorite, varying abruptly from rose pink to deep purple in color, occurs at the upper mine opening intimately intergrown with fibrous scapolite. At the Limekiln Vein fluroite of a purple color occurs in granular masses of considerable size. Veinlets of coarse foliated margarodite, made up of interlocking crystals, have the crystals separated by thin layers of fluorite, and deep purple fluorite forms thin plates between the plates of mica. Rather broad cleavable masses of colorless to pale salmon or brown fluorite occur associated with fibrous margarite. In the breaking down of the abundant topaz to form muscovite the liberated fluorine has recombined with the available lime to form fluorite.

CRONSTEDTITE.

Cronstedtite has been reported from here,[1] but none was seen by the writer. No data as to its mode or place of occurrence are given, and until the mineral has been examined chemically or optically its identity with cronstedtite must remain in doubt.

DIASPORE.

Diaspore is mentioned as coming from here in Dana's Mineralogy, and it is to be expected in the topaz veins, although none was seen by the writer.

PROCHLORITE.

A careful search was made of all the openings in the hope of finding cronstedtite, which has been reported from here. Nothing comparable with this ferric chlorite was found, but there were noted, in joints in marble in the bottom of the main pit, some narrow veins filled with a greenish black chlorite, which formed fine granular friable aggregates of small variously oriented crystals. Where free surfaces are present the chlorite exhibits the vermiform curved prismatic crystals commonly called helminthe forms. These free surfaces are usually coated with manganese oxide. The granular aggregates look entirely like the prochlorite from the District of Columbia.[2]

Upon analysis the mineral was found to have the composition given in Column I below. In Column II are given the results obtained by Clarke upon the chlorite from the District of Columbia described by Merrill.

Analyses of prochlorite from Trumbull and Washington

Constituent.	I.	II.
SiO_2	23.69	25.45
Al_2O_3	21.26	17.88
FeO	26.52	24.98
MgO	17.60	15.04
CaO	3.32	....
MnO	.43	....
Na_2O	....	.67
H_2O	7.63	14.43
	100.45	98.45

Aside from the water content, which is a little low, the composition of the Trumbull chlorite approaches the average of available analyses of prochlorite. Computing the molecular ratios from the above analysis, however, leads to the following significant results:

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[1] Hoadley, Chas. W., An American Occurrence of Cronstedtite. Amer. Min., vol. 3, p. 6, 1918.

[2] Merrill, G. P., Proc. U. S. Nat. Mus., vol. 7, p. 67, 1884.

Ratios of prochlorite from Trumbull, Connecticut.

SiO_2	.3929	.3929	1.88	2× .94
Al_2O_3	.2080	.2080	1.00	1×1.00
FeO	.3691	.8707	4.18	4×1.04
MgO	.4365			
CaO	.0591			
MnO	.0060			
H_2O	.4235	.4235	2.04	2×1.02

The present mineral then approximates the simple formula:

$$4(Fe,Mg)O.Al_2O_3.2SiO_2.2H_2O$$

or,

$$H_4\ (Mg,\ Fe)_4\ Al_2\ Si_2O_{13}.$$

A comparison of the univalent oxides yields further suggestive relationships, for instance:

Ratios of univalent oxides of prochlorite from Trumbull.

FeO	.3691	.4342	1×1.00
CaO	.0591		
MnO	.0060		
MgO	.4365	.4365	1×1.01

Thus the prochlorite from Trumbull approximates the composition expressed by the formula:

$$2FeO.\ 2MgO.\ Al_2O_3.\ 2SiO_2.\ 2H_2O$$

with the ferrous oxide in small measure replaced by lime and manganous oxide. The calculated values to satisfy the above formula are given with the analytical figures opposite for comparison in the next table:

	1	2
SiO_2	23.69	24.96
Al_2O_3	21.26	21.16
FeO (+CaO+MnO)	30.27	29.74
MgO	17.60	16.68
H_2O	7.63	7.46
	100.45	100.00

1. Analysis of prochlorite from Trumbull, CaO and MnO united with FeO without recalculation.
2. Values to satisfy formula $2FeO.\ 2MgO.\ Al_2O_3.\ 2SiO_2.\ 2H_2O$.

It is noteworthy that a large majority of the best analyses of prochlorite agree quite as well with this composition as they do with each other. In the present instance the amount of lime is unusual and suggests contamination by calcite, but this was definitely not the case the homogeneity and purity of the analyzed sample being thoroughly proven both chemically and optically. While there is danger of overdoing the simplification of formulas, especially those of complex minerals like the chlorites, the tendency heretofore has been quite in the opposite direction, complex molecules containing hundreds of atoms being assumed to explain analyses too often inaccurate or made upon material of doubtful purity. The writer has recently critically examined several species of the chlorite group without finding it necessary to call upon a complicated or irrational formula to explain any analysis made upon homogeneous and optically distinct material. Results at present are wholly tentative, but the investigations will be continued as opportunity offers, and it is hoped that a plausible and thorough revision of this group of minerals can be advanced when sufficient work has been completed.

The mineral under discussion has the following properties: Color, greenish black; luster, somewhat pearly; powder, pale green. Before the blowpipe exfoliates somewhat and fuses with difficulty to a black magnetic slag. It is slightly attacked by hot nitric or hydrochloric acid. After long digestion in hot sulphuric acid colorless scales remain. Yields neutral water at a high temperature in the closed tube.

Optically the mineral is biaxial, with the axial angle, 2V, approaching zero. Optically positive (+); acute bisectrix perpendicular to the perfect cleavage. Under the microscope is seen to be made up of plates of hexagonal outline, transparent and of a deep green color. The pleochroism is distinct:

α=bright brownish grass green.
β=bright brownish grass green.
γ=pale greenish brown.

Refractive indices:

$\alpha=1.621\pm.003$.
$\beta=1.618\pm.003$.
$\gamma=1.618\pm.003$.
$\alpha-\gamma=.005\pm.003$.

For comparison the similar prochlorite from the District of Columbia described by Merrill (Cat. U.S.N.M. No. 45,875) was examined and found to have the following optical properties: Biaxial; 2V, very small; optically positive; acute bisectrix perpendicular to the perfect cleavage. Scales wholly irregular.

Refractive indices:

α=1.606±.003.
β=1.606±.003.
γ=1.610±.003.
$\alpha-\gamma$= .006±.003.

Pleochroism distinct:

α= deep blue green.
β= deep blue green.
γ= pale brownish green.

These two chlorites, while essentially identical in all properties except refractive index, differ sharply in this respect. It is regrettable that additional analyzed prochlorites were not available for comparison. Until the properties, both chemical and optical, of this group are more fully known, the Trumbull material must be included with prochlorite, despite the difference in refractive indices.

EPIDOTE.

A block of material in the dump of the upper mine consisted in large part of a columnar ash gray to brownish gray or nearly white mineral in prismatic crystals imbedded in glassy quartz. There is a small amount of green hornblende in the quartz and patches of calcite occur as the last deposit in cavities.[1] By dissolving out the calcite, clear brown to gray crystals of the prismatic mineral are obtained. These resemble zoisite, but when measured were found to have the angles of epidote. The prisms are formed by elongation of the dome zone parallel to the b axis, which is the characteristic habit of epidote. Terminations are rare, and when they occur they are very simple with imperfect faces. Upon analysis the following results were obtained:

Analysis of epidote from Trumbull.

	Per cent.
SiO_2	36.89
Al_2O_3	28.50
Fe_2O_3	5.92
FeO	.52
CaO	27.26
MgO	.21
MnO	.02
H_2O	1.29
F	.60
Total	101.21

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[1] Specimens entirely similar to this preserved in the United States National Museum contain a nearly white scheelite in grains and masses and are labeled "ore, Trumbull, Conn." (Cat. 73696.)

Although the total iron is low, the angles agree very well with those of normal epidote, showing but little approach to the clinozoisite ratios. The forms positively identified on several crystals measured are given below:

a (100)
c (001)
o (011)
n $(\bar{1}11)$
e (101)
Ω (105)
s $(\bar{2}03)$
i $(\bar{1}02)$
r $(\bar{1}01)$
l $(\bar{2}01)$
f $(\bar{3}01)$
N $(\bar{3}04)$
ω $(\bar{1}04)$
κ $(\bar{3}02)$
σ $(\bar{1}03)$

Several forms were noted on single crystals which could not be identified, but unless the readings are unusually dependable the orientation of unterminated crystals is very difficult. The best terminated crystal is shown in figure 1. The angles obtained upon this crystal are compared with those given for epidote by Dana in the following table:

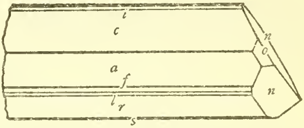

FIG. 1.—CLINOGRAPHIC PROJECTION OF A CRYSTAL OF EPIDOTE.

Measured and calculated angles of epidote.

	Measured.		Calculated.		
	°	′	°	′	″
c ∧ *a* =(001) ∧ (100)	64	36	64	36	50
c ∧ *i* =(001) ∧ (102)	34	20	34	21	00
c ∧ *s* =(001) ∧ (203)	45	2	45	37	00
c ∧ *r* =(001) ∧ (101)	63	49	63	42	00
c ∧ *l* =(001) ∧ (201)	89	4	89	26	00
c ∧ *f* =(001) ∧ (301)	99	19	98	37	00
a ∧ *o* =(100) ∧ (011)	77	15	77	2	30
a′ ∧ *n* =(100) ∧ (111)	69	20	69	2	00
n ∧ *n‴* =(111) ∧ (111)	70	13	70	29	00

Before the blowpipe the mineral turns dark brown and fuses to a dark-brown bead which is not magnetic; yields strongly acid water in the closed tube; under the microscope is transparent fragments having a faintly brown color which is not pleochroic and is probably due to dispersion by submicroscopic inclusions. The fragments under the microscope show a very well-defined cleavage, probably parallel to the basal pinacoid, *c*(001). The indices of refraction as determined by immersion claim no great accuracy, as the series of immersion media had rather wide intervals in this range and the values given are approximated by interpolation. The figures arrived at are:

$\alpha=1.706\pm.003$
$\beta=1.710\pm.003$
$\gamma=1.720\pm.003$
$\alpha-\gamma=.014\pm.003$

A portion of the analyzed powder has been preserved in the type materials series as is the practice here and is available should it be desirable to recheck these values. The values given above for mean refractive index and birefringence approach those of zoisite, as is to be expected in material of such low iron content. The fluorine, which occurs in small amount, is of interest, since fluorine has not heretofore been noted as a constituent of epidote,[1] although it is to be expected that fluorine would replace the basic hydroxyl of epidote as readily as that of other similarly constituted minerals. Fluorine seems to have been abundantly present in the emanations forming the Long Hill veins, and a constant content of fluorine runs through all the minerals of the area, as noted under scapolite and margarite below.

TOPAZ.

Topaz is present in the quartz veins in quite unusual amount. The best locality is that described as the Limekiln Vein. This vein, which has been opened for a distance of some 75 feet, is from 1 to 5 feet wide. The vein originally consisted almost entirely of quartz and topaz, the quartz being considerably more abundant than the topaz. An extensive alteration, probably under deep-seated conditions not dissociated from a stage in the regional metamorphism of the area, has resulted in the partial conversion of the topaz to secondary minerals. The alumina of the topaz has gone to form muscovite of the variety known as margarodite with less margarite. The fluorine has combined with lime probably derived from the marble of the walls to form fluorite.

The topaz occurs in coarse crystalline masses of gray to pale yellow or white color, with well-defined cleavage, some of the cleavage surfaces being a foot in diameter. Most of the topaz contains veins and disseminated scales of margarodite, and large masses of margarodite contain cores of corroded and embayed topaz. Where the topaz abuts against small open cavities in the center of the vein it is bounded by rough crystal planes. Many of these cavities have been filled with coarse foliated margarodite not derived from the adjacent topaz crystals, as the surfaces of these crystals are not corroded.

In the main pit topaz occurs in greenish nodular masses with poorly defined cleavage, now in part altered to margarodite, in the narrow quartz veins which contain black sphalerite. Topaz of the same type occurs in several other smaller veins. The foliated mica margarodite occurs everywhere in the quartz veins, and this type of mica seems in all cases to have been derived from the alteration of topaz even where no topaz now remains.

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[1] An epidote from Italian Mountain, Gunnison County, Colo., analyzed by Eakins, contained 0.35 per cent of fluorine, U. S. Geol. Survey, Bull. 591, p. 316, 1915.

MARGARODITE.

A foliated and radiated pearly mica from this locality has been widely distributed in old collections, labeled margarodite. This mica is very abundant in the limekiln vein, where it occurs as an alteration product of the topaz as aggregates of scales often grouped in spherical or fan-shaped bunches. In color the margarodite ranges from pale yellow to smoky brownish gray. The yellowish variety occurs replacing the large crystals of topaz. The grayish type is coarser and occurs in open spaces lined by topaz crystals and as narrow veins in which the crystals grow from either wall and interlock loosely in the center of the vein, the spaces of which are filled with colorless to purple fluorite. Some of the coarsest of the mica is deep blue, apparently from thin layers of deep blue fluorite inserted between the laminae. The margarodite is in plates which uniformily show the structure found in commercial mica deposits and known as feathering evidently due to twinning. In appearance this material is more pearly than ordinary muscovite and laminae are more brittle.

Upon analysis of selected cleaned plates the results, given in column I below, were obtained. In columns II and III are given the results obtained upon analysis of margarodite from this locality by J. Lawrence Smith.[1]

Analyses of margarodite from Trumbull.

	I.	II.	III.
	Per cent.	*Per cent.*	*Per cent.*
SiO_2	46.88	46.50	45.70
Al_2O_3	36.42	33.91	33.76
Fe_2O_3	1.98	....	....
FeO	.82	2.69	3.11
CaO	1.77	....	....
MgO	1.36	.90	1.15
MnO	Trace.	....	....
Na_2O	.38	2.70	2.85
K_2O	6.24	7.32	7.49
F	([a])	.82	.82
H_2O	4.03	4.63	4.90
Total	99.88	99.47	99.78

[a] Not determined.

Fluorine was present in sufficient quantity to give a distinct reaction, but was not estimated. Chemically this differs from normal muscovite only in the amount of water which replaces the potash, and this difference is not great. That the water is basic is established by the high temperature required to liberate it. When the mineral was heated over a blast flame until the hard glass tube softened completely only 0.93 per cent of water was obtained. The amount of water given above was obtained by using a fire brick and charcoal oven, with the blast as recommended by Penfield.

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[1] Smith, J. Lawrence, Amer. Journ. Sci., ser. 2, vol. 16, pp. 46, 47.

Optically this mica differs sharply from muscovite in indices of refraction. The following optical data were obtained: Biaxial, negative; axial angle, 2V; moderately large.

Indices of refraction:
$\alpha=1.549\pm.003$.
$\beta=1.579\pm.003$.
$\gamma=1.590\pm.003$.
$\alpha-\gamma=.041\pm.003$.

The variation in mean index of refraction doubtless accompanies reciprocal variation of potash and hydroxyl.

Mica of this foliated type occurs in practically all of the quartz veins of this vicinity, as seen especially in the main pit and in small openings along the tramway. It is probably in all cases derived from topaz.

MARGARITE.

Associated with the margarodite and topaz of the limekiln vein were blocks of a micaceous fibrous mineral which in the field was supposed to represent a fibrous phase of the margarodite. This material which apparently came from the wall of the vein, next the marble, forms veinlets from 2 to 4 inches thick. The mineral extends out from either side of the veinlet for an inch or more as a compact layer of straight or very slightly curved fibers perpendicular to the wall. These fibers do not meet in the centers of the veinlets which contain a confused granular aggregate of the same substance in which masses of colorless to pale salmon fluorite and clear large plates of margarodite are scattered. There is interposed between the layers of this fibrous material and the adjacent limestone a band from 2 to 10 inches thick, largely composed of granular fluorite which varies in color from brownish salmon adjacent to the fibrous vein to purple next the marble. The mass of fibers is compact and tough in the aggregate but is readily pulverized in a mortar wherein it differs from margarodite. In color the fibrous mineral is snowy white and the luster is pearly. Upon analysis the results in column 1 of the following table were obtained. In column 2 is given, for comparison, the analysis by J. Lawrence Smith of margarite from Chester, Massachusetts,[1] and in column 3 are given the values calculated to satisfy the formula $CaO.2Al_2O_3.2SiO_2.H_2O$.

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[1] Dana, J. D., Syst. Min., ed. 6, p. 637.

Analyses of margarite.

Constituents.	1. Trumbull.	2. Chester.	3. Theory.
	Per cent.	*Per cent.*	*Per cent.*
SiO_2	33. 72	32. 21	30. 20
Al_2O_3	50. 27	48. 87	51. 30
Fe_2O_3	. 66	2. 50	....
FeO	Trace.	....	....
CaO	10. 48	10. 02	14. 00
MgO	. 47	. 32	....
MnO	Trace.	. 20	....
H_2O	1. 90	4. 61	4. 50
F	. 14	....	....
Li_2O	....	. 32	....
K_2O	1. 64	1. 91	....
Na_2O	. 74		
Total	100. 02	100. 96	100. 00

This composition approaches that of margarite, and although the analysis differs from those of normal margarites in several respects, chiefly in the lower water content, it is evidently a variety of that mineral.

Optical determinations upon the analyzed material were not entirely satisfactory, the indices of refraction varying from grain to grain. Under the microscope the material is in flat shreds of rectangular outline. Most of these are optically negative, but some appear to be optically positive. The final accepted figures for the indices of refraction are as follows:

$$\alpha=1.620\pm003$$
$$\beta=1.629\pm003$$
$$\gamma=1.630\pm003$$
$$\alpha-\gamma=.010\pm003$$

The analyzed material showed no margarodite under the microscope, the latter mineral being readily distinguishable by its lower index of refraction.

Similar fibrous material occurs elsewhere in the quartz veins, typical though iron stained blocks of some size being seen along the borders of the quartz veins in the main pit.

SCAPOLITE.

Radiated scapolite occurs in quartz, intimately associated with rose pink to purple fluorite, in blocks of material in the dump of the upper mine. The scapolite is faintly brownish white in color and has a somewhat wax-like luster. The aggregates are coarse to fine columnar and are made up of elongated prismatic crystals from 1 to 5 millimeters in diameter, which sometimes reach 6 centimeters in length. These prisms only rarely exhibit well-defined prismatic planes and are never terminated in the specimens collected. The fluorite, which is intimately intergrown with the scapolite, is in part rose pink and in part deep purple, the colors varying abruptly. A large specimen of the scapolite was crushed and fluorite free fragments carefully selected and ground for analysis. Upon this powder the following results were obtained:

Analysis of scapolite from Trumbull.

	Per cent.
SiO_2	51.38
Al_2O_3	25.22
Fe_2O_3	trace.
CaO	15.16
MgO	.73
MnO	trace.
Na_2O	2.86
K_2O	1.20
H_2O	.55
F	2.74
Cl	1.98
Total	101.82
Deduct O=Cl, F.	

Under the microscope the material is transparent and colorless with excellent prismatic cleavage. The indices of refraction as determined by immersion are:

$$\omega=1.553\pm.003$$
$$\epsilon=1.540\pm.003$$
$$\omega-\epsilon=.013\pm.003$$

While obviously belonging with the scapolite group this mineral is somewhat unusual in composition. The fluorine content was thought to represent fluorite included in the analyzed powder despite precautions. Careful microscopic examination of the powder, however, failed to detect appreciable amounts of fluorite or other extraneous substance. If the fluorine be considered as replacing the chlorine of the marialite molecule, the alkalies become deficient. It seems quite possible that there is here represented a fluorine member of this group, the composition being capable of explanation by assuming the presence of a fluor-meionite in isomorphous mixture. Despite the low soda content the present mineral approaches marialite in refractive indices. It resembles marialite also in being unattacked by boiling concentrated hydrochloric acid.

A REVISION OF THE NORTH AMERICAN SPECIES OF ICHNEUMON-FLIES BELONGING TO THE GENUS APANTELES.

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INTRODUCTION.

The work herewith presented is the result of studies made in the United States National Museum at Washington during the summer of 1919 while the writer was under temporary appointment in the Bureau of Entomology. More or less contributory data had been gathered in the course of a previous appointment in the Bureau of Entomology, at the Gipsy Moth Laboratory, at Melrose Highlands, Massachusetts, and some information had been brought together during the winter and spring of 1918–19 at Cornell University. But it was not until the great mass of valuable material in the collection of the United States National Museum had been worked over that an understanding of the North American species of this large and important genus was possible.

Of the 164 species recognized in this paper 136 are represented in the United States National Museum by type, cotype, or paratype specimens, and only 14 are entirely unrepresented by authentic material; the holotypes of 119 species are deposited here, including those of 36 new species, which are described in this work. Types of 8 of Ashmead's West Indian species are in the British Museum and have not been seen; nor have those of 4 other West Indian species described by Cresson, which are deposited in the Academy of Sciences at Philadelphia. The Provancher Collection, in the Museum of Public Instruction at Quebec, Canada, contains the type specimens of five North American species of Apanteles, all described by Provancher, which the writer has had no opportunity of studying. These have been recognized and placed in the key on the basis of the original descriptions and notes made by A. B. Gahan, of the Bureau of Entomology, upon an examination of the type material several years ago.

The Connecticut Agricultural Experiment Station in New Haven is the depository for the types of five species, a study of which was made possible by the issuance of a special authorization by the Bureau of Entomology for the journey to New Haven. None of the type specimens of Say's four common species is now in existence, but an abundance of material in the National Collection placed in these species by Ashmead and Viereck has been carefully checked with the original descriptions and is regarded as valid. Types of six other species have not been studied—that of *nephoptericis* Packard, the location of which is uncertain; of *ninigretorum* Viereck, which seems to have disappeared; of *carpatus* Provancher (not *carpatus* Say), which has been destroyed; of *americanus* Lepeletier, evidently deposited in an European collection; and of *glomeratus* Linnaeus and *melanoscelus* Ratzeburg, European species which have been introduced into this country. Since *nephoptericis* Packard and *carpatus* Provancher are unrecognizable from the original descriptions they have not been included in the key to species; *ninigretorum* Viereck has been included, but not separated from *ensiger* Say; the writer's conception of *americanus* Lepeletier is based on the original description and on specimens in the National Collection so labeled by Ashmead. A large amount of valid material of *melanoscelus* Ratzeburg was studied at the Gipsy Moth Laboratory, in Melrose Highlands, Massachusetts, and many large series, both European and American, of *glomeratus* were available in the National Collection.

The writer desires to express his deep appreciation and sincere gratitude to A. B. Gahan, of the Bureau of Entomology, for much helpful advice in the course of the work, for his kindly and valuable criticism of the manuscript, and for aiding generally in every possible way in the preparation of this paper. Acknowledgment of indebtedness is also due Dr. W. E. Britton, of the Connecticut Agricultural Experiment Station, for the opportunity of examining the type material deposited at New Haven. For the loan of collections of *Apanteles* at their respective institutions the writer is indebted to Prof. G. A. Dean, of the Kansas Agricultural Experiment Station; Prof. S. A. Forbes, of the University of Illinois; Prof. Harrison Garman, of the Kentucky Agricultural Station; Dr. F. A. Fenton, of the Iowa Agricultural Experiment Station; and Prof. C. P. Gillette, of the Colorado Station.

CLASSIFICATION.

Superfamily ICHNEUMONOIDEA.

Family BRACONIDAE.

Subfamily MICROGASTERINAE.

Genus APANTELES.

Apanteles FOERSTER, Verh. naturh. Ver. preuss. Rheinl., vol. 19, 1862, p. 245.—VIERECK, Proc. Ent. Soc. Wash., vol. 11, 1909, p. 208

Pseudapanteles ASHMEAD, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 166.

Protapanteles ASHMEAD, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 166.

Parapanteles ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1901, p. 131.

Cryptapanteles VIERECK, Proc. Ent. Soc. Wash., vol. 11, 1909, p. 209 (=*Apanteles* Ashmead, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 166, not Foerster).

Urogaster ASHMEAD, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 166 (=*Apanteles* Ashmead, not Foerster).

Apanteles (*Dolichogenidea*) VIERECK, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 173.

Stenopleura VIERECK, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 187.

Head usually transverse, rarely rostriform; occiput immargined; antennae slender, 18-segmented; eyes strongly hairy; thorax stout, broad; mesoscutum without parapsidal furrows, very rarely with the furrows evident posteriorly; propodeum usually more or less roughened, with or without a median longitudinal carina, sometimes incompletely areolated; anterior wing with the marginal cell open, only the first abscissa of the radius being present; second transverse cubitus entirely wanting, so that the second cubital cell is open behind; legs normal; abdomen sessile, varying in form from broad and depressed to very slender and strongly compressed; the two basal abdominal tergites usually more or less sculptured; ovipositor sheaths varying in length from subexserted to longer than the abdomen.

Apanteles belongs to the genuine Microgasterinae; it is, however, readily separated from *Microgaster* and *Microplitis*, its nearest allies, by the total absence of the second transverse cubital nervure in the fore wing.

Believing *Apanteles* in the broad sense to be one homogeneous group, and not susceptible of division into distinct smaller groups, as first suggested by Ashmead and later followed to some extent by Viereck, I have disregarded entirely the names proposed by Ashmead and Viereck, which are listed above in the synonymy; it has not even seemed advisable to retain them as subgenera because they merge so completely into one another.

Because of the large number of species in this genus, and because the differences between species are in many cases very slight and not well marked, and, further, because of the wide variation often found among individuals of the same species, the preparation of a workable key has been attended by serious difficulties. Without the aid of a large amount of biological data available, particularly at the

United States National Museum, it is doubtful whether this could have been accomplished at all. Information relative to the hosts and cocoons is valuable, and sometimes aids greatly in the absolute determination of a particular species. This information has especially helped the writer to determine the extent to which various structural characters could be relied upon for the separation of species.

In some sections of the genus color, especially color of the tegulae and of the legs, can be safely used to distinguish species; and color of the dorsum of the abdomen and of the antennae are sometimes sufficiently constant to be useful, but in other cases they are of no value. The wings supply but few good characters; however, the length of the first abscissa of the radius as compared with that of the transverse cubitus has been found valuable, as have also the color of the wings, the length of the metacarpus as compared with that of the stigma, and the direction of the nervellus. Leg characters, other than color, that have been employed are the length of the inner spur of the posterior tibiae as compared with that of the outer spur and with the metatarsus, and the sculpture on the outer face of the posterior coxae. The variation in the length of the female antennae has been found useful in a few instances, and the length of the ovipositor, varying from subexserted to longer than the abdomen, is often valuable in separating individuals of this sex. But the most important distinguishing characters are found in the sculpture of the propodeum, and in the shape and sculpture of the two basal abdominal tergites; many considerable differences occur which are quite constant; and yet even here the variation within species is often so great that other supporting characters must be employed. In all cases it is very desirable, when making determinations, to have before one a good series of specimens that individual variations may be noted and fully allowed for.

Probably all species of *Apanteles* are parasitic exclusively upon the larvae of Lepidoptera; at least there is no authentic record of a species of this genus having been bred from a larva of another order. Within themselves the species are by no means restricted to a single host, but almost invariably the hosts are very closely related, or at least there is a similarity of larval habit. *Apanteles congregatus* Say, for example, has been reared from a large number of hosts, none of these, however, being outside the family Sphingidae. *Apanteles xylinus* Say, *laeviceps* Ashmead, *griffini* Viereck, and *grenadensis* Ashmead are cutworm parasites, but apparently make no distinction between different species of cutworms; *Apanteles ornigis* Weed appears to infest leaf-miners only, but is not restricted to a particular species, attacking those forms which spend their entire larval life within a mine as well as those which are true miners but a short time. Evidently all that is necessary in this last case is that the host larva should be a miner in the stage which the parasite prefers for oviposition. General similarity of appearance and close resemblance of habit apparently suffice to invite attack by a particular species of *Apanteles*.

Some species are solitary, while many others are gregarious, in the latter case sometimes as many as 100 or more individuals issuing from a single host. There seems, however, to be no correlation at all between this biological characteristic and any structural characters which might divide the genus into well-marked groups. The difference between the cocoons is often very striking. In color they vary through yellow and buff to dark brown and dark gray; and, in the case of the gregarious species, differ widely as to arrangement and the extent to which they are surrounded by loose silk.

As natural control agents of injurious insect pests many species of *Apanteles* assume an important rôle. Many of our most common injurious species are to a large extent held in check by parasites of this group. Among these may be mentioned *Pieris rapae* Linnaeus, the cabbage butterfly, also the gipsy and the brown-tail moths, and many cutworms, including the army worms. Because the genus contains species of widely diverse habits and biologies, the larvae of no considerable group of Lepidoptera are free from their attacks.

KEY TO THE SPECIES OF APANTELES.

1. Propodeum with a distinct areola, which is usually margined by strong carinae; if not sharply outlined, then the first abdominal tergite has a more or less distinct median longitudinal depression on the apical half, the second tergite is short, transverse and broader at apex than at base, and the ovipositor is at least half as long as the abdomen------------2.

Propodeum without an areola, often with a median carina from base to apex------------52.

2. Abdomen very short and broad, and strongly depressed; the three basal abdominal tergites large, occupying practically all of the dorsum of the abdomen, and entirely rugose; propodeal areola very large and broad diamond-shaped, sharply margined; ovipositor sheaths subexserted.
1. *bucculatricis*, new species.

Abdomen never so short and broad and depressed, and never with the three basal abdominal tergites wholly rugose and occupying almost the entire dorsum of the abdomen------------3.

3. Face strongly rostriform, the malar space long; ovipositor sheaths as long as the abdomen------------4.

Face normal------------6.

4. Posterior femora black------------2. *banksi* Viereck.

Posterior femora dark testaceous------------5.

5. Propodeum and first abdominal tergite coarsely rugose, the propodeal areola defined by very strong ridges; second abdominal tergite uniformly roughened------------3. *crassicornis* (Provancher).

Propodeum and first abdominal tergite not so coarsely roughened, the latter only finely rugulose on the apical half; second tergite almost entirely smooth and shining------------4. *dolichocephalus*, new species.

6. Ovipositor very short, hardly exserted; propodeum with a very large, almost quadrate areola, and with strong costulae arising at the base of the areola; apical lateral areas of the propodeum very large, perfectly smooth and highly polished within; legs pale testaceous, including the fore and middle coxae; a very small species------------5. *aletiae* Riley.

Ovipositor at least nearly half as long as the abdomen; propodeum never with a quadrate areola, nor with the costulae arising at the base of the areola; at least not combining all the characters noted above----7.

7. Thorax, abdomen and legs honey-yellow or reddish-testaceous-----------8.

Thorax always black; abdomen mostly or entirely black----------------9.

8. Length 4 mm.; wings dark fuliginous------------6. *nigriceps* (Ashmead).

Length 2.5 mm.; wings hyaline-----------------7. *imitator* (Ashmead).

9. Posterior polished area on the lateral face of the scutellum large, triangular in shape, and extending almost to the base of the scutellar disk; tegulae always yellowish or transparent-whitish--------------------10.

Posterior polished area on the lateral face of the scutellum much smaller, usually semicircular in shape, and rarely extending half way toward base of scutellar disk along the side of the latter, the roughened striate area in front very large; tegulae variable in color-----------------21.

10. Second abdominal tergite uniformly roughened and opaque------------19.

Second abdominal tergite smooth and shining, at most with a few punctures--11.

11. All coxae and second and third abdominal tergites testaceous.
8. *cinctus* (Provancher).

At least posterior coxae black; dorsum of the abdomen black---------12.

12. Nervellus straight, not curving at all toward base of wing; posterior femora black; propodeal areola rather circular-------9. *laevicoxis*, new species.

Nervellus distinctly curving behind toward base of wing--------------13.

13. First abdominal tergite smooth and shining, with only a median longitudinal depression on the apical half, and much broader at apex than at base; posterior femora testaceous; malar space with a pale spot.
10. *disputabilis* (Ashmead).

First abdominal tergite usually distinctly punctate or rugulose; otherwise not combining all the above characters------------------------------14.

14. Posterior femora testaceous in both sexes; ovipositor sheaths longer than the abdomen; lateral membranous margins along the first and second abdominal tergites blackish------------11. *paranthrenidis*, new species.

Posterior femora black or blackish in the male, and usually in the female; when dark testaceous in the female, then ovipositor sheaths are hardly as long as the abdomen, and the membranous margins along the apical half of the first abdominal tergite are testaceous--------------------15.

15. First abdominal tergite opaque, rugose; disk of scutellum very flat and wholly impunctate---16.

First abdominal tergite strongly shining, and only punctate or indistinctly roughened; disk of scutellum with some punctures along the sides---17.

16. First abdominal tergite very slender, parallel-sided--12. *epinotiae* Viereck.

First abdominal tergite broad, trapezoidal-----13. *balthazari* (Ashmead).

17. Ovipositor sheaths projecting hardly half the length of the abdomen; first abdominal tergite very slender, at least twice as long as broad at apex, and indistinctly punctate, the lateral membranous margins blackish.
14. *leucostigmus* (Ashmead).

Ovipositor sheaths at least almost as long as the abdomen; otherwise not combining all the characters noted above------------------------------18.

18. Ovipositor very strongly decurved at apex; lateral membranous margins along first abdominal tergite black; posterior femora deep black in both sexes------------------15. *thurberiae*, new species.

Ovipositor but slightly decurved at apex; lateral membranous margins along the first abdominal tergite dark testaceous; posterior femora reddish-testaceous in female, blackish in male------16. *megathymi* Riley.

19. Posterior femora black; wings white with clear stigma--17. *harti* Viereck.

Posterior femora mostly testaceous; wings hyaline with brown stigma---20.

20. Ovipositor sheaths half as long as the abdomen; nervellus curved behind toward base of wing; posterior femora and tibiae wholly testaceous. 18. *phthorimaeae*, new species.

Ovipositor sheaths as long as the abdomen; nervellus not curved; posterior femora blackish on apical third-----------19. *acrobasidis*, new species.

21. Posterior coxae entirely or mostly pale; abdomen often with more or less of the third and following tergites testaceous; sometimes the basal segments of antennal flagellum yellow------------------22.

Posterior coxae black; abdomen black above; antennal flagellum unicolorous, black or brown------------------25.

22. Second abdominal tergite roughened and dull; mesoscutum and disk of scutellum coarsely punctate and dull; basal segments of antennal flagellum yellow------20. *ensiger* (Say); also 21. *ninigretorum* Viereck.

Second abdominal tergite smooth and polished------------------23.

23. Disk of scutellum very flat, wholly impunctate an dhighly polished; third abdominal tergite more or less testaceous laterally; ovipositor sheaths about half as long as the abdomen-----------22. *xanthopus* (Ashmead).

Disk of scutellum somewhat punctured------------------24.

24. Abdomen entirely black above, dark fuscous beneath. 23. *leucopus* (Ashmead).

Abdomen with more or less reddish-yellow on the dorsal tergites; venter of abdomen largely pale------------------24. *pinos* (Cresson).

25. Abdomen long and very slender, strongly compressed; first and second abdominal tergites finely ruguloso-striate; ovipositor sheaths exceedingly slender and a little longer than the abdomen; hind femora black, at least black along the upper and lower edges------------------26.

Abdomen not so slender; otherwise not combining all the above characters------------------27.

26. Propodeum finely rugulose and dull; the areola sharply margined; posterior femora entirely black------------------25. *betheli* Viereck.

Propodeum punctate and shining; the areola not strongly circumscribed by carinae; posterior femora black only along the edges------------------ 26. *californicus*, new species.

27. Tegulae yellowish------------------28.

Tegulae black------------------43.

28. Propodeum with areola strongly margined by prominent carinae, and with distinct costulae; second abdominal tergite sometimes entirely smooth and highly polished------------------29.

Propodeum without costulae; second abdominal tergite never smooth and highly polished------------------39.

29. Second abdominal tergite entirely smooth and polished; hind femora always yellowish or testaceous------------------30.

Second abdominal tergite rugulose, at least posteriorly; if practically entirely smooth and polished the hind femora are blackish------------36.

30. Ovipositor sheaths hardly half as long as the abdomen; first abdominal tergite narrowing from the middle to the apex, and with the smooth median longitudinal depression not bounded by sharp carinae-------31.

Ovipositor sheaths about as long as the abdomen; first abdominal tergite not narrowing to the apex, and with a long, slender, sharply-margined longitudinal fovea-------33.

31. First abdominal tergite rugulose-------27. *pseudoglossae*, new species.

First abdominal tergite smooth, at most with a few scattered punctures-32.

32. First abdominal tergite at least two and one-half times as long as broad at apex, narrower at apex than at base, and with the sides not bulging outwardly-------28. *hyalinus* (Cresson).

First abdominal tergite about twice as long as broad at apex, not distinctly narrower at apex than at base, the sides bulging outwardly-------29. *vulgaris* (Ashmead).

33. First abdominal tergite entirely smooth-------30. *insularis*, new name.

First abdominal tergite more or less rugulose-------34.

34. All coxae black-------35.

Only the posterior coxae black-------31. *rhomboidalis* (Ashmead).

35. Abdomen entirely black above; stigma clear, pigmented only around margin-------32. *meridionalis* (Ashmead).

Third abdominal tergite largely testaceous; stigma brown-------
33. *conanchetorum* Viereck.

36. Antennal scape yellow; second abdominal tergite delicately aciculated-------34. *piceoventris*, new name.

Antennae unicolorous-------37.

37. Mesoscutum with the parapsidal grooves distinct posteriorly; second abdominal tergite finely longitudinally aciculated.
35. *aciculatus* (Ashmead).

Mesoscutum without indication of parapsidal grooves-------38.

38. Wings whitish-hyaline, the stigma pale brown and very broad, the veins colorless; ovipositor sheaths almost as long as the abdomen; antennae brown and shorter than the body in the female-------36. *carpatus* (Say).

Wings hyaline, the stigma and veins brown; ovipositor sheaths only half as long as the abdomen; antennae deep black, and as long as the body in the female-------37. *forbesi* Viereck.

39. Propodeum rugose and opaque, the areola entirely strongly margined; stigma always brown-------40.

Propodeum only weakly roughened and shining, sometimes merely punctate; areola not separated from a narrow, rather indistinct basal median area-------42.

40. Posterior femora black-------38. *ephestiae* Baker.

Posterior femora mostly pale-------41.

41. Posterior femora entirely yellow-------39. *edwardsii* Riley.

Posterior femora reddish-testaceous, with the apical third black-------
40. *plesius* Viereck.

42. Disk of scutellum wholly impunctate and very highly polished; mesoscutum shining, very shallowly, almost indistinctly, punctate, with fine inconspicuous pubescence-------41. *polychrosidis* Viereck.

Disk of scutellum with some punctures, opaque; mesoscutum opaque, distinctly closely punctate, and, together with the disk of scutellum, very strongly, conspicuously pubescent-------42. *canarsiae* Ashmead.

43. Posterior femora reddish-testaceous-------43. *fumiferanae* Viereck.

Posterior femora black-------44.

44. Mesoscutum and disk of scutellum closely deeply punctate or rugoso-punctate and dull; propodeum exceedingly coarsely rugose, with a large areola, which is margined by prominent carinae; first and second abdominal tergites roughened____________________44. *trachynotus* Viereck.
Never so coarsely roughened____45.

45. Propodeum punctate, shining, and the areola merely represented by a depression without prominent margins______________________________46.
Propodeum rugose, or at least with the areola sharply margined by carinae ____48.

46. Posterior tibiae deep reddish-testaceous, at most with the extreme apex dusky; apical margin of the second abdominal tergite practically straight____45. *miantonomoi* Viereck.
Posterior tibiae with at least the apical half black or fuscous, the base rather luteous; apical margin of the second abdominal tergite usually distinctly arcuated, especially in the female_________________________47.

47. Stigma narrow, without a pale spot at base; second abdominal tergite usually with striate roughening______________________46. *melanopus* Viereck.
Stigma broad, with a distinct pale spot at base; second abdominal tergite smooth and shining, rarely slightly punctate__________47. *cacoeciae* Riley.

48. Propodeal areola broad pentangular, margined by prominent carinae; costulae very prominent, marking off large, smooth, and shining, apical lateral areas______________________________________48. *lacteicolor* Viereck.
Propodeal areola usually slender; costulae wanting___________________49.

49. Second abdominal tergite entirely smooth and polished; disk of scutellum flat, wholly impunctate, very highly polished__49. *diatraeae*, new species.
Second abdominal tergite roughened and opaque_______________________50.

50. First abdominal tergite very broad at base, narrowing gradually from base to apex; both first and second abdominal tergites closely rugulose; wings hyaline, the stigma and veins very dark brown; ovipositor sheaths about half as long as the abdomen, and broad__________50. *laspeyresiae* Viereck.
First abdominal tergite not distinctly narrowing from base to apex; wings rather whitish____51.

51. Ovipositor sheaths hardly half as long as the abdomen; areola open at base____51. *tischeriae* Viereck.
Ovipositor sheaths at least two-thirds as long as the abdomen; areola completely circumscribed, closed at base by two oblique carinae converging anteriorly_____________________________________52. *aristoteliae* Viereck.

52. First abdominal tergite very long and broad, the sides parallel; the second and third tergites large and rectangular; first and second tergites coarsely rugoso-punctate and black; the third rugose, a crescent-shaped area at its base black; remainder of the abdomen largely reddish-testaceous; head, mesoscutum, and disk of scutellum very coarsely punctate; propodeum coarsely rugoso-punctate, with a strong median longitudinal carina, and with the posterior margin strongly curved, so that the apical angles project very prominently; stigma and veins of forewing fulvous; the radius arising almost three-fourths the way out on the stigma; ovipositor sheaths two-thirds as long as the abdomen______53. *terminalis* (Gahan).
Not combining all the above characters________________________________53.

53. First abdominal tergite large, base and apex of equal breadth; the second tergite short and broad, at least three to four times as broad as long; ovipositor sheaths two-thirds as long as the abdomen________________54.
First and second abdominal tergites not as above_______________________57.

54. Posterior femora black__________________54. *femur-nigrum* (Provancher).
Posterior femora mostly pale____55.

55. Propodeum smooth and polished; abdominal tergites mostly smooth------- 55. *parallelis* (Ashmead).

Propodeum and the two basal abdominal tergites coarsely rugose-------56.

56. Most of the thorax and the abdomen entirely red or reddish-testaceous---- 56. *nigrovariatus*, new species.

Thorax entirely and most of the abdomen black--57. *consimilis* (Viereck).

57. First abdominal tergite distinctly narrower at the apex than at the base; very rarely with the apex apparently as broad as base (*alaskensis* Ashmead), and then the abdomen exceedingly slender and strongly compressed, with the second tergite very long-triangular-----------------58.

First abdominal tergite never narrower, usually distinctly broader, at apex than at base---95.

58. Face strongly rostriform, malar space long; ovipositor more than half as long as the abdomen---59.

Face normal--60.

59. Propodeum wholly impunctate and highly polished; first and second abdominal tergites smooth and polished; ovipositor sheaths at least as long as the abdomen-------------------------58. *cockerelli*, new species.

Propodeum and the two basal abdominal tergites distinctly punctate; ovipositor sheaths hardly two-thirds as long as the abdomen------------ 59. *dakotae*, new species.

60. At least the face, the prosternum and mesosternum, and the entire venter of the abdomen honey-yellow--61.

Face and prosternum and mesosternum black--------------------------62.

61. Entirely honey-yellow, except the head above and behind black; ovipositor sheaths almost as long as the abdomen; female antennae black, with a striking white annulus near the middle----60. *annulicornis* (Ashmead).

Dorsum of thorax and abdomen dark brownish-black-------------------- 61. *brunneus* (Ashmead).

62. First and second abdominal tergites entirely smooth, impunctate and highly polished; first tergite very slender, strongly narrowed to the apex; the second triangular and very narrow at base; hind femora yellowish or yellowish-brown; ovipositor sheaths hardly visible----------88.

First and second abdominal tergites at least somewhat roughened at the sides or posteriorly; rarely entirely smooth, and then not combining the above characters ---63.

63. Tegulae and hind femora testaceous or reddish-testaceous; wings very often more or less fuliginous or yellowish---------------------------64.

Tegulae dark brown or black; rarely transparent-whitish, and then the hind femora entirely black; wings usually hyaline; posterior coxae and the dorsum of the abdomen always black-----------------------------75.

64. Propodeum with a sharp median longitudinal carina from base to apex--65.

Propodeum without a distinct median longitudinal carina from base to apex, at most with a broad shining median longitudinal elevation extending to the base---72.

65. Propodeum perfectly smooth, except for the strong median longitudinal carina, highly polished; ovipositor sheaths at least as long as the abdomen; hind coxae black; wings hyaline---------------62. *sesiae* Viereck.

Propodeum more or less roughened, never polished; ovipositor sheaths not as long as the abdomen; hind coxae usually testaceous; wings more or less fuliginous or somewhat yellowish--------------------------------66.

66. Second abdominal tergite very short and broad, much more than twice as broad at apex as long---67.

Second abdominal tergite rather triangular, never twice as broad at apex as long; ovipositor sheaths never quite half as long as the abdomen---68.

67. All coxae testaceous---------------63. *choreuti* Viereck.
Posterior coxae black---------------64. *sancti-vincenti* Ashmead.

68. First abdominal tergite at apex and the second at base as broad as the latter is long down the middle; ovipositor sheaths projecting at least one-third the length of the abdomen---------------69.
First abdominal tergite at apex and the second at base only about half as broad as the latter is long down the middle; ovipositor sheaths scarcely exserted ---------------70.

69. Dorsum of abdomen beyond the black first tergite mostly reddish or reddish-testaceous; venter of abdomen entirely yellowish; ovipositor sheaths honey-yellow to reddish---------------65. *cinctiformis* (Viereck).
Dorsum of abdomen mostly blackish; venter of abdomen blackish at apex; ovipositor sheaths blackish---------------66. *papaipemae*, new species.

70 All coxae stramineous---------------71.
Posterior coxae dark brown or black; radius of forewing a little longer than transverse cubitus, and not uniting with it in a sharp angle ---------------67. *luteipennis*, new species.

71. Wings hyaline---------------68. *longicornis* (Provancher).
Wings somewhat yellowish; radius of forewing usually distinctly shorter than transverse cubitus, and making a strong angle with it ---------------69. *radiatus* Ashmead.

72. All coxae testaceous; first and second abdominal tergites mostly smooth and shining, with only a few weak striulae and punctures at the sides; propodeum indistinctly punctate---------------70. *flavovariatus*, new species.
Posterior coxae dark brown or black---------------73.

73. First abdominal tergite broader at apex than second is long, the latter much broader at apex than long down the middle; ovipositor sheaths at least half as long as the abdomen, strongly curved, sickle-like.
71. *neomexicanus*, new species.
First abdominal tergite narrower at apex than second is long; the second hardly as broad at apex as long; ovipositor sheaths but very slightly exserted, straight---------------74.

74. Posterior femora entirely pale stramineous and somewhat compressed; the third and following abdominal tergites usually castaneous; stigma and veins of forewing very pale brown, the radius slender and longer than the transverse cubitus---------------72. *sarrothripae* Weed.
Posterior femora dark reddish-testaceous, usually edged with blackish; abdominal tergites black; stigma and veins of forewing dark brown; the radius no longer, usually shorter, than the transverse cubitus, and joining the latter in a very strong angle---------------73. *alticola* (Ashmead).

75. Posterior femora entirely, and the fore and middle femora mostly, black---------------76.
Posterior femora mostly, and the fore and middle femora entirely, yellowish to dark testaceous---------------83.

76. Stigma large; the metacarpus short, a little shorter than the stigma----81.
Stigma moderate; the metacarpus at least a little longer than the stigma---------------77.

77. First and second abdominal tergites smooth and polished, or only indistinctly punctate---------------78.
First and second abdominal tergites rugulose---------------79.

78. Propodeum with a prominent median longitudinal carina; ovipositor sheaths half as long as the abdomen---------------74. *etiellae* (Viereck).
Propodeum without a median longitudinal carina, very smooth and shining; ovipositor sheaths not projecting---------------75. *cassianus* Riley.

79. Wings somewhat infumated; ovipositor sheaths almost as long as the abdomen------------------------------------76. *victoriae*, new species.
 Wings perfectly hyaline, not at all clouded------------------------------80.

80. First abdominal tergite smooth and polished on basal half; second tergite much broader at apex than long; radius of forewing longer than transverse cubitus and uniting with it in a sharp angle. 77. *monticola* Ashmead.
 First abdominal tergite entirely minutely rugulose and opaque; second tergite no broader at apex than long-----------78. *glacialis* (Ashmead).

81. Radius of forewing much shorter than transverse cubitus; ovipositor sheaths hardly exserted-------------------------79. *feltiae* (Viereck).
 Radius of forewing at least as long as transverse cubitus; ovipositor sheaths almost as long as the abdomen----------------------------82.

82. All legs entirely black; abdomen slender, compressed posteriorly. 80. *niger*, new species.
 All tibiae mostly testaceous; abdomen broad, not compressed posteriorly. 81. *scutellaris*, new species.

83. Parapsidal depressions distinct on the posterior two-thirds of mesoscutum; radius of forewing much shorter than transverse cubitus, and arising more than two-thirds of the way out on the stigma; first and second abdominal tergites coarsely rugose; wings slightly infumated. 82. *thoracicus*, new name.
 Parapsidal depressions not distinct; otherwise not combining all the above characters--84.

84. Second abdominal tergite much narrower at base and but little broader at apex than long; ovipositor sheaths subexserted--------------------85.
 Second abdominal tergite much broader at base than long, and at least twice as broad at apex as long; ovipositor sheaths very broad and at least two-thirds as long as the abdomen------83. *stagmatophorae* Gahan.

85. Fore and middle coxae and the extreme apex of hind coxae pale; the three basal segments of the female antennal flagellum yellowish. 84. *compressus* Muesebeck.
 All coxae black; antennae entirely black--------------------------------86.

86. First abdominal tergite parallel-sided to near the apex, and then rounded off strongly---87.
 First abdominal tergite narrowing gradually from base to apex. 85. *compressiventris*, new species.

87. Posterior coxae with a conspicuous elongate-oval flattened area on outer face above; abdomen rather short, oval---------86. *phigaliae* Muesebeck.
 Posterior coxae evenly rounded at base; abdomen very slender, strongly compressed----------------------------------87. *alaskensis* (Ashmead).

88. Mesoscutums, disk of scutellum and propodeum wholly impunctate, perfectly smooth and highly polished---------------------88. *politus* Riley.
 Mesoscutum more or less punctate; propodeum rugulose or punctate, or with a median carina--89.

89. All coxae entirely stramineous-------------------89. *militaris* (Walsh).
 At least posterior coxae black---90.

90. Fore and middle coxæ black--92.
 Fore and middle coxae bright yellow----------------------------------91.

91. Propodeum finely rugulose---------------------90. *floridanus*, new species.
 Propodeum smooth and polished, but with a median longitudinal carina. 91. *sordidus* Ashmead.

92. Tegulae stramineous---------93.
Tegulae dark brown or black; antennae deep black and very long in both sexes---------92. *nigricornis*, new species.

93. Propodeum strongly punctate and opaque; a conspicuous, large, oblong-oval, flattened area on the outer face of hind coxae at base above, which is punctate within---------93. *websteri*, new species.
Propodeum weakly punctate and shining; hind coxae without such large flattened area on outer face above---------94.

94. Disk of scutellum impunctate and very highly polished; radius of forewing a little longer than transverse cubitus----94. *caffreyi*, new species.
Disk of scutellum somewhat punctate, not polished; radius of forewing not longer than transverse cubitus---------95. *herbertii* Ashmead.

95. Abdomen very slender and exceedingly strongly compressed, at least as long as the thorax, and distinctly more than four times (usually much more) as long as broad in widest part; the two basal abdominal tergites striated; tegulae dark brown or black---------96.
Abdomen not so long and slender and strongly compressed---------98.

96. Posterior femora black---------96. *gillettei* Baker.
Posterior femora testaceous---------97.

97. Abdomen entirely black above, and deep fuscous to black on the sides and venter; wings clear hyaline---------97. *parastichtidis*, new species.
Abdomen more or less testaceous on third and fourth dorsal segments; sides and venter almost entirely testaceous; wings slightly yellowish.
98. *pholisorae* Riley.

98. Disk of scutellum large, convex, and closely coarsely punctate, or ruguloso-punctate and dull; first and second, and usually most of the third, abdominal tergites coarsely rugose; all coxae black or blackish; tegulae usually black, if yellowish, then with the first abdominal tergite very slender and parallel-sided---------99.
Disk of scutellum not so coarsely rough and dull; at least not combining all the above characters---------103.

99. Tegulae yellow; first abdominal tergite very slender and parallel-sided.
99. *junoniae* Riley.
Tegulae black or blackish---------100.

100. Third abdominal tergite only weakly roughened at extreme base; hind femora always testaceous; second abdominal tergite usually distinctly shorter than the third---------100. *lunatus* (Packard).
Third abdominal tergite mostly rugose, or the hind femora mostly black; second abdominal tergite distinctly as long as the third---------101.

101. Posterior femora largely pale; or, if mostly blackish, with the wings white---------102.
Posterior femora black; wings hyaline---------101. *limenitidis* (Riley).

102. Hind femora stramineous; antennae brownish----102. *agricola* (Viereck).
Hind femora dark testaceous, with more or less blackish, at least on the apical third---------103. *nemoriae* Ashmead.

103. Antennae in both sexes dark brown or blackish, with the basal flagellar segments bright yellow; wings infumated; radius of forewing shorter than transverse cubitus, and making a sharp angle with it; tegulae, fore and middle coxae, and usually the hind coxae, yellowish to reddish-testaceous; spurs of posterior tibiae apparently equal in length, and not one-half as long as the metatarsus; second and third abdominal tergites almost always deep red in color---------104. *rufocoxalis* Riley.
Not combining all the above characters---------104.

104. Posterior coxae dull and very coarsely punctate or granular on the outer face; spurs of the hind tibiae about equal in length and never longer than half the metatarsus, usually distinctly shorter; first and second abdominal tergites entirely, and sometimes the third in part, rugose, the first broadening gradually from base to apex, the second broad with the sides parallel; radius of forewing not longer than transverse cubitus --105.

Posterior coxae not coarsely granular on outer face; or at least not the above combination of characters------------------------------------112.

105. Third abdominal tergite more or less roughened, at least somewhat granular, on the basal third or half; if practically smooth, as in some male specimens, then either the antennae are mostly bright yellow, or the hind femora are blackish; stigma normal, and distinctly shorter than the metacarpus --106.

Third abdominal tergite smooth and polished; rarely, with fine striulae basally in the middle, and then the stigma abnormally large, a little longer than the metacarpus; male antennae always black; hind femora always pale --108.

106. Fore and middle coxae yellow; tegulae yellowish or pale brown; usually more or less of the third and following abdominal tergites, and the entire venter of the abdomen, reddish-yellow--------105. *scitulus* Riley.

All coxae black; tegulae black; venter and sides of the abdomen at least black on the apical half--107.

107. Posterior femora stramineous, with only the extreme apex dusky; male antennae largely yellow---------------------------106. *xylinus* (Say).

Posterior femora black, or reddish-brown edged above with blackish; antennae of both sexes black--------------107. *yakutatensis* Ashmead.

108. Tegulae and fore and middle coxae yellow; third abdominal tergite entirely bright yellow------------------------------------108. *crambi* Weed.

Tegulae blackish; third abdominal tergite at the most reddish-yellow laterally--109.

109. Venter of the abdomen mostly black; disk of scutellum smooth, impunctate and highly polished---111.

Venter of the abdomen mostly yellow or testaceous; scutellum with some shallow, but distinct, punctures; third and often the following tergites of the abdomen testaceous laterally----------------------------------110.

110. Stigma very large, very pale brown, transparent, a little longer than the metacarpus; hind femora and tibiae fuscous at extreme apex; posterior coxae closely punctate on outer face; third abdominal tergite often with some striulae basally in the middle------109. *plathypenae*, new species.

Stigma moderate, a little shorter than the metacarpus; hind femora entirely pale testaceous, not at all fuscous at apex; posterior coxae coarsely granular on the outer face----------------110. *autographae*, new species.

111. Abdomen short, broad-ovate; the posterior margin of the second abdominal tergite curving forward somewhat at the sides; basal segments of the antennal flagellum in the female pale----111. *griffini* (Viereck) in part.

Abdomen more elongate; the posterior margin of the second abdominal tergite usually straight; antennae in both sexes wholly black.
112. *laeviceps* Ashmead.

112. First abdominal tergite with base and apex apparently of equal breadth, the sides parallel, or bulging somewhat; first and second tergites, and usually the third at base, rugose and dull; inner spur of hind tibiae not longer than half the metatarsus; ovipositor sheaths often projecting almost the length of the first abdominal tergite--------------113.

First abdominal tergite broadening gradually from base to apex; or, if apex is apparently no broader than base, then first and second tergites are largely smooth and shining, and the second subtriangular, being narrowed at base, or the inner spur of the posterior tibiae is distinctly longer than half the metatarsus; ovipositor sheaths never strongly projecting, usually subexserted--------120.

113. Entirely stramineous--------113. *robiniae* (Fitch).

Mostly black--------114.

114. Propodeum without a median longitudinal carina, and partly smooth and shining; ovipositor sheaths strongly projecting, about as long as the first abdominal tergite; abdomen never strongly compressed; dorsal abdominal tergites always black--------115.

Propodeum rugose, dull, usually with a distinct median longitudinal carina; ovipositor sheaths subexserted, or with the abdomen strongly compressed on the apical half; sometimes the third tergite testaceous laterally--117.

115. Inner spur of posterior tibiae distinctly longer than the outer; legs varying in color from entirely yellowish, including the coxae, to black; tegulae usually pale--------114. *ornigis* Weed.

Inner spur of posterior tibiae not longer than outer; tegulae always black--------116.

116. Mesoscutum and disk of scutellum smooth and strongly shining; posterior femora mostly testaceous, at least in the female-115. *bedelliae* (Viereck).

Mesoscutum and disk of scutellum opaque, the latter distinctly punctate; legs in both sexes deep black--------116. *rohweri*, new name.

117. Third abdominal tergite roughened on basal half in the middle--------118.

Third abdominal tergite practically smooth--------119.

118. Abdomen short, broad; posterior coxae with a conspicuous flattened, shining area on outer face at base above; posterior tibiae blackish on apical two-thirds; apical margin of second abdominal tergite straight.
117. *empretiae* (Viereck).

Abdomen rather slender, strongly compressed posteriorly in the female; posterior coxae rather evenly rounded at base, without such flattened area; posterior tibiae dusky only at extreme apex; apical margin of the second tergite often curving forward at the sides.
118. *diacrisiae* Gahan.

119. Posterior coxae black; posterior femora and tibiae entirely yellow; posterior margin of second abdominal tergite straight.
119. *depressus* (Viereck).

Posterior coxae usually yellowish on apical half; posterior femora always blackish on apical fourth above, also apex of posterior tibiae blackish; posterior margin of second abdominal tergite usually distinctly curving forward at the sides--------120. *pyralidis*, new species.

120. Second abdominal tergite subtriangular, much broader at apex than at base, hardly as broad at base as long; first tergite very slightly, or not at all, broader at apex than at base; both first and second tergites partly smooth and shining; inner spur of posterior tibiae very long, about two-thirds as long as the metatarsus--------121. *paleacritae* Riley.

Second abdominal tergite very rarely subtriangular, and then with the inner spur of posterior tibiae not longer than half the metatarsus----121.

121. First abdominal tergite slender, no broader at apex than at base. the second very short, much broader at apex than at base, and defined laterally by sharp oblique grooves, mostly smooth and shining; hind femora largely blackish or fuscous; inner spur of posterior tibiae longer than the outer, and distinctly longer than half the metatarsus--122. *euchaetis* Ashmead.

Not the above combination of characters--------122.

122. Tegulae yellow or testaceous; very rarely brown in the male, and then suturiform articulation is very broad and foveolate, the posterior margin of the second abdominal tergite distinctly curved posteriorly toward the sides, and the two basal tergites and the base of the third coarsely rugose; hind femora always testaceous__________________148.

Tegulae brown or black; posterior coxae always black; hind femora sometimes black____123.

123. All femora entirely brownish-black; all tibiae entirely dark brown; second abdominal tergite almost entirely smooth and shining.
123. *hallii* (Packard).

At least the fore femora partly yellowish; tibiae mostly pale_________124.

124. Radius of forewing much shorter and stouter than the transverse cubitus, and making a strong angle with the latter, a distinct knob at the point of union; second abdominal tergite very smooth and shining; posterior coxae wholly impunctate and highly polished; posterior femora pale.
124. *atalantae* (Packard).

Radius of forewing not so short and stout; otherwise not combining all the above characters____125.

125. Posterior femora variable in color, often black or blackish; if mostly yellowish, inner spur of posterior tibiae is longer than the outer and a little longer than half the metatarsus; first abdominal tergite always distinctly broader at apex than at base, the second never subtriangular or strongly narrowed at base____126.

Posterior femora always yellowish or testaceous; inner spur of posterior tibiae not, or indistinctly, as long as half the metatarsus, and often not longer than the outer spur; first abdominal tergite sometimes not broader at apex than at base, the second sometimes subtriangular__141.

126. Stigma short and broad, the radius arising in the middle and perpendicular to the anterior margin of the wing; first and second abdominal tergites partly, the third and following entirely, smooth and shining; posterior femora black or blackish____________________________125. *theclae* Riley.

Not the combination of characters noted above_________________________127.

127. Second abdominal tergite largely smooth and shining; hind femora always brownish-black or black in the male, sometimes in the female; when hind femora are yellowish (some female specimens) abdomen is compressed on apical half, and the antennae are as long as the body.
126. *electrae* (Viereck).

Second abdominal tergite usually entirely roughened; if mostly smooth, not combining the above characters_____________________________________128.

128. Posterior femora black or blackish; rarely testaceous in the female, and then the abdomen very suddenly and sharply compressed on the apical half, and the hypopygium projecting distinctly beyond the apex of the last dorsal segment____129.

Posterior femora mostly testaceous; abdomen never so strongly and suddenly compressed; hypopygium never projecting beyond apex of last dorsal segment of the abdomen_____________________________________134.

129. Third abdominal tergite more or less roughened on basal half; all coxae and trochanters, and the hind femora, black__________________________130.

Third abdominal tergite entirely smooth and polished_________________131.

130. Mesoscutum and disk of scutellum very shallowly and indistinctly punctate, strongly shining; radius of forewing perpendicular to anterior margin of wing, not tending outward, and with no knob at the point of union with the transverse cubitus____________127. *melanoscelus* (Ratzeburg).

Mesoscutum and disk of scutellum distinctly punctate, the former usually opaque; radius of forewing somewhat oblique to anterior margin of wing, and tending outward; usually a small knob at the point of union of the radius and transverse cubitus----------128. *flaviconchae* Riley.

131. Inner spur of posterior tibiae longer than the outer and a little longer than half the metatarsus--132.

Inner spur of posterior tibiae apparently not at all longer than the outer, and not quite half as long as the metatarsus--------------------133.

132. Mesopleura very coarsely punctate or granular anteriorly and along the lower edge; abdomen in female very sharply compressed on apical half--129. *koebelei* Riley.

Mesopleura entirely strongly shining, with only scattered punctures anteriorly; abdomen short and broad, not compressed.
130. *anisotae*, new species.

133. Stigma narrow; radius of forewing arising far out on stigma, so the inner side of the latter is almost twice as long as the outer side; disk of scutellum very small, perfectly smooth and very highly polished.
131. *nitens*, new species.

Stigma broader, the inner side but very slightly longer than the outer.
132. *carduicola* (Packard).

134. Sides and venter of the abdomen entirely dark testaceous, the dorsum more or less castaneous beyond the second tergite; radius of forewing not longer than the transverse cubitus-------133. *hesperidivorus* (Viereck).

Sides and venter of abdomen at least black on posterior half, and the dorsum entirely black; radius of forewing usually longer than tranverse cubitus---135.

135. First and second abdominal tergites entirely coarsely rugose, the third more or less roughened at base-------------------------------------136.

Third abdominal tergite wholly smooth and polished-----------------138.

136. Abdomen very broad, almost half as broad as long; first abdominal tergite at least as broad at apex as long, and twice as broad at apex as second abdominal tergite is long; radius of forewing much longer than transverse cubitus-------------------------------------134. *cyaniridis* Riley.

Abdomen not so broad; first tergite broadening but slightly toward apex, and only a little broader at apex than second tergite is long-------137.

137. Inner spur of posterior tibiae very stout and long, at least two-thirds as long as the metatarsus; venter of abdomen yellow on basal half; hind coxae closely punctate on outer face below.
135. *acaudus* (Provancher).

Inner spur of posterior tibiae not so long; venter of abdomen fuscous on basal half; posterior coxae mostly smooth and shining on outer face--136. *argynnidis* Riley.

138. Mesoscutum very sparsely punctate, the punctures sharp and separate, confined to the anterior two-thirds of the mesoscutum, the posterior third being impunctate and highly polished; disk of scutellum perfectly flat, wholly impunctate and exceedingly highly polished; first abdominal tergite punctate, the second smooth and shining medially; hind coxae very smooth and polished; female antennae as long as the body--137. *prenidis*, new species.

Never so strongly shining, nor with mesoscutum and scutellum so highly polished; at least not combining all the above characters----------139.

139. Abdomen short, broad-ovate, almost half as broad on the third dorsal segment as long; hypopygium not quite attaining the apex of the abdomen; female antennae much shorter than the body.
138. *podunkorum* (Viereck).

Abdomen not so short and broad, often somwhat compressed; the hypopygium attaining the apex of the last dorsal abdominal segment------140.

140. Second abdominal tergite largely smooth and shining; female antennae very much shorter than the body----------------139. *pyraustae* (Viereck).

Second abdominal tergite entirely roughened; female antennae as long as the body----------------------------------140. *phobetri* (Rohwer).

141. Third abdominal tergite roughened on basal half---141. *delicatus* Howard.

Third abdominal tergite smooth---------------------------------------142.

142. Posterior coxae somewhat granular above at base; disk of scutellum wholly impunctate and highly polished; first and second abdominal tergites entirely roughened --147.

Posterior coxae smooth and shining above; disk of scutellum at least indistinctly punctate; usually basal half of the first abdominal tergite and part of the second smooth and shining------------------------143.

143. Antennae yellowish beneath; stigma transparent; wing veins pale yellowish; length, 1.7 mm--------------------142. *algonquinorum* (Viereck).

Antennae dark brown or black; stigma and veins brown; larger species-144.

144. Wings slightly infumated, the veins and stigma dark brown; the subdiscoideus distinctly pigmented all the way to the margin of the wing; radius of the forewing oblique to the anterior margin of the wing, tending outward, and uniting with transverse cubitus in a very sharp angle; second abdominal tergite subtriangular, defined laterally on basal half by oblique grooves, and very narrow at base; a large, stout species.
143. *tmetocerae*, new species.

Wings hyaline; veins and stigma not so dark brown; subdiscoideus not pigmented to the margin of the wing------------------------------145.

145. First and second abdominal tergites entirely rugulose and dull; all coxae and trochanters black; radius of forewing about equal to the transverse cubitus--144. *orobenae* Forbes.

First and second abdominal tergites more or less smooth and shining, at least the first smooth and polished on basal half------------------146.

146. Mesoscutum very shallowly, almost indistinctly, punctate; hind coxae with a very conspicuous, punctate, oval, flattened area on the outer face above--145. *hydriae*, new species.

Mesoscutum closely, distinctly punctate, the punctures confluent along the lines where the parapsidal furrows would be if present; hind coxae without such flattened area on outer face above-146. *glomeratus* (Linnaeus).

147. Wings hyaline; abdomen elongate; suturiform articulation straight and very sharp; female antennae as long as the body, the flagellum not pale basally--147. *acronyctae* Riley.

Wings slightly infumated; abdomen short-ovate; posterior margin of second abdominal tergite usually distinctly curving forward at the sides; female antennae distinctly shorter than the body, the two basal flagellar segments pale---------------------------111. *griffini* (Viereck), in part.

148. Abdomen entirely testaceous; propodeum and thoracic pleura more or less dark reddish to reddish-testaceous----------148. *flaviventris* (Cresson).

Abdomen at least partly black; thorax entirely black---------------149.

149. Inner spur of posterior tibiae longer than the outer, and at least a little longer than half the metatarsus-----------------------------------153.

Inner spur of posterior tibiae not distinctly longer than the outer and not quite half as long as the metatarsus-------------------------------150.

150. Third abdominal tergite somewhat roughened at base; apical margin of second tergite curved posteriorly at the sides; suturiform articulation broad and foveolate--151.
Third abdominal tergite smooth and shining; apical margin of second tergite not curved posteriorly at the sides-------------------------152.

151. Radius perpendicular to the anterior margin of the wing, and much longer than the transverse cubitus; female antennae as long as the body--------------------------------------149. *hyphantriae* Riley.
Radius oblique to the anterior margin of the wing, tending outward, and very slightly or not at all longer than the transverse cubitus; female antennae distinctly shorter than the body-----150. *clisiocampae* Ashmead.

152. First and second abdominal tergites rugulose; hind coxae mostly yellowish; tegulae dark testaceous-------------151. *euphydryidis*, new species.
First and second abdominal tergites mostly smooth; hind coxae black; tegulae pale stramineous--------------------------152. *smerinthi* Riley.

153. Third abdominal tergite somewhat roughened on the basal half or more-154.
Third abdominal tergite smooth--------------------------------------156.

154. Third tergite rugoso-striate on basal two-thirds, striations sometimes reaching the posterior margin of the tergite medially--------------------155.
Third tergite only punctate or weakly granular on the basal half.
153. *murtfeldtae* Ashmead.

155. Disk of scutellum rather dull and closely sharply punctate; venter of abdomen and apical half of posterior coxae usually testaceous; hind coxae rather granular-----------------------------154. *grenadensis* Ashmead.
Disk of scutellum shining, very weakly punctate; venter of abdomen mostly and hind coxae entirely black; hind coxae smooth--155. *fiskei* (Viereck).

156. Posterior coxae yellowish---157.
Posterior coxae black--158.

157. Antennae with the scape yellow and the flagellum pale beneath; dorsum of abdomen beyond third tergite mostly red--156. *obscuricornis* (Viereck).
Antennae entirely fuscous; abdominal tergites usually black.
157. *marginiventris* (Cresson).

158. Third abdominal tergite more or less testaceous or reddish, at least reddish along entire lateral and apical margins; abdomen often entirely testaceous beyond second tergite; antennae usually pale; posterior coxae usually mostly testaceous--159.
Third abdominal tergite wholly black; antennae and posterior coxae black---162.

159. First abdominal tergite with the sides bulging strongly, the plate indistinctly broader at apex than at base; both first and second tergites closely rugulose-----------------------------158. *charadrae*, new species.
First abdominal tergite distinctly broader at apex than at base, the sides not bulging strongly--160.

160. Abdomen short-ovate, depressed; second abdominal tergite entirely rugose; antennae pale; posterior coxae black-------------159. *flavicornis* Riley.
Abdomen more elongate, and usually more or less compressed on apical half; the second tergite in large part smooth; posterior coxae usually testaceous on apical half--161.

161. Abdomen slender, very strongly compressed on apical half; posterior coxae black; venter of abdomen mostly black---160. *mayaguezensis* (Viereck).
Abdomen not so strongly compressed; venter of abdomen usually entirely testaceous; dorsum of abdomen beyond second tergite often reddish-testaceus; hind coxae usually pale at least at tip.
161. *americanus* (Lepeltier).

162. Posterior margin of the second abdominal tergite curved forward somewhat at the sides; if not distinctly so, then the tergite is smooth and polished -- 162. *schizurae* Ashmead.

Posterior margin of second abdominal tergite straight; abdomen usually compressed on the apical half -- 163.

163. Second abdominal tergite rugose; the third tergite usually with numerous hairpits; the third and following tergites giving off bluish reflections -- 163. *congregatus* (Say).

Second abdominal tergite smooth and polished medially; the third and following tergites entirely smooth, without distinct hair-pits, deep black and very highly polished; abdomen in female strongly compressed. 164. *hemileucae* Riley.

DESCRIPTIONS OF SPECIES.

1. APANTELES BUCCULATRICIS, new species.

Differs very markedly from all other species of this genus in that it possesses a very large areola on the propodeum, and at the same time has the three basal abdominal tergites entirely coarsely rugose and occupying almost the entire dorsum of the abdomen, while the ovipositor is subexserted.

Female.—Length, 1.8 mm. Face apparently narrowing somewhat below, shining, and with a rather distinct median longitudinal ridge; antennae at least as long as the body; vertex and temples weakly punctate and shining; mesoscutum with sharp punctures; disk of scutellum almost impunctate, polished; mesopleura largely polished; propodeum punctate and shining, with a very large and broad diamond shaped areola and prominent costulae; a short median longitudinal ridge leading from the base of the areola to the base of the propodeum; forewing with the stigma large, and the radius decidedly longer than the transverse cubitus; hind wing with the nervellus oblique but not curved toward base of wing; posterior coxae mostly smooth and shining; abdomen broad, depressed, the first tergite large, broader at apex than at base, and a little longer than broad at apex, more than a third as long as the adomen; second tergite rectangular, a little longer than the third; the three basal abdominal tergites entirely coarsely uniformly rugose, and occupying practically all of the dorsum of the abdomen; the membranous margins on the apical third of the first tergite and along the second are so narrow as to be indistinct; ovipositor sheaths subexserted. Entirely black, including antennae, the tegulae, and the legs, except the base of all the tibiae, and the fore and middle tarsi, which are pale; wings slightly clouded, the veins and stigma black.

Male.—Essentially as in the female.

Type locality.—Palo Alto, California.

Type.—Cat. No. 22512, U.S.N.M.

Host.—*Bucculatrix* on *Quercus agrifolia.*

Described from one female and four male specimens bred by F. C. Herbert, in the Bureau of Entomology, under Hopkins, U. S. No. 15027Bb.

2. APANTELES BANKSI Viereck.

Apanteles (*Dolichogenidea*) *banksi* VIERECK, Proc. U. S. Nat. Mus., vol 40, 1911, p. 173.

Habitat.—Maryland.

Host.—Unknown.

The species is known only from the unique type in the United States National Museum.

3. APANTELES CRASSICORNIS (Provancher).

Microgaster crassicornis PROVANCHER, Addit. Faun. Canad. Hymenop., 1886, pp. 139, 142.

Apanteles crassicornis PROVANCHER, Addit. Faun. Canad. Hymenop., 1888, p. 388.

Habitat.—Canada, Maryland, Iowa, Michigan, Illinois.

Host.—Unknown.

The type of this species has not been seen by the writer, his conception of the species being based upon a specimen in the National collection determined by A. B. Gahan after an examination of the type. This specimen was collected at Agricultural College, Michigan. In addition, the National Collection contains a female specimen taken at Carlinville, Illinois, by Charles Robertson; also another female reared by H. L. Parker at Hagerstown, Maryland, September 10, 1916. The writer has also seen three female specimens, taken at Ames, Iowa, which are in the collection of the Iowa Agricultural Experiment Station.

4. APANTELES DOLICHOCEPHALUS, new species.

Very similar to *crassicornis*, from which it differs in having the propodeum and the two basal abdominal tergites much less coarsely rugose, also in having a large pale spot at the base of the stigma.

Female.—Length, 4.2 mm. Face much lengthened, rostriform, the malar space long; face and vertex of head very finely punctate, shining; mesoscutum with numerous exceedingly minute punctures; disk of scutellum flat, sparsely punctate; mesopleura mostly smooth and polished; propodeum rugoso-punctate, with a distinct roughly circular areola; apical angles projecting strongly posteriorly; forewing with the metacarpus longer than the stigma, and the radius much longer than the transverse cubitus; posterior coxae shining; inner spur of posterior tibiae not quite half the length of the metatarsus; abdomen large and stout, at least as long as the thorax; first tergite broad at base, narrowing somewhat toward apex, finely ruguloso-striate, and with an indistinct median longitudinal depression on apical half; second tergite transverse, very short, but longer medially than at the sides, the posterior margin decidedly arcuate, in large part smooth and shining, with only a few weak striulae; remainder of the abdomen smooth and polished; ovipositor sheaths longer than the abdomen. Deep black in color; forewing with stigma dark brown, except for a large pale spot at base; all coxae black; the remainder of the legs dark testaceous, except the extreme apex of the posterior tibiae and the posterior tarsi, which are fuscous; ovipositor sheaths black.

Type locality.—Falls Church, Virginia.

Type.—Cat. No. 22513, U.S.N.M.

Described from one specimen collected by Mr. Nathan Banks on September 19. Viereck's manuscript name has been adopted.

5. APANTELES ALETIAE Riley.

Apanteles aletiae Riley, Trans. Acad. Sci. St. Louis, vol. 4, pt. 2, 1881, p. 306.

Habitat.—Florida, Alabama.

Host.—*Alabama argillacea* Hübner (Riley).

Cocoons.—White; gregarious, but not imbedded in loose silk.

In addition to the type series the National collection contains a single specimen collected by E. A. Schwarz at Selma, Alabama.

6. APANTELES NIGRICEPS (Ashmead).

Urogaster nigriceps Ashmead, Trans. Ent. Soc. London, 1900, pt. 2, p. 284.

Habitat.—St. Vincent.

Host.—Unknown.

Three cotypes in the United States National Museum have been studied; other cotypes are in the British Museum.

7. APANTELES IMITATOR (Ashmead).

Urogaster imitator Ashmead, Trans. Ent. Soc. London, 1900, pt. 2, p. 288.

Habitat.—St. Vincent.

Host.—Unknown.

The unique type of this species is in the British Museum, and no specimens have been seen by the writer.

8. APANTELES CINCTUS (Provancher).

Microgaster cinctus Provancher, Natural. Canad., vol. 12, 1881, p. 196; Faun. Entom. Canad., Hymenop., 1883; Addit. Faun. Canad. Hymenop., 1886, p. 139.

Apanteles cinctus Provancher, Addit. Faun. Canad. Hymenop., 1888, p. 388.

Habitat.—Canada.

Host.—Unknown.

Type in the Museum of Public Instruction at Quebec, Canada, and not examined. It has been given its position in the key on the basis of the original description and notes made by A. B. Gahan upon a study of the type specimen.

9. APANTELES LAEVICOXIS, new species.

Female.—Length, 2.7 mm. Face broader than long, punctate, opaque; a short, very narrow, median longitudinal groove on face just below the insertion of the antennae; vertex, temples, and cheeks closely punctate and dull; mesoscutum very closely, evenly punctate and opaque; scutellum with the disk large, slightly longer than broad at base, sparsely punctate and strongly shining; the polished area on the lateral face of scutellum large, reaching almost to the base of the disk; mesopleura punctate anteriorly, polished posteriorly, without a foveolate groove; propodeum coarsely punctate and dull on anterior half, and with a distinctly margined, rather circular, shining areola medially; the apical lateral areas strongly shining, the apical angles prominent; forewing with the radius apparently equal in length to the transverse cubitus, and uniting with the latter in an even curve without an angle at the point of union; posterior wing with the nervellus straight, not curving at all toward the base of wing, as in related species; posterior coxae smooth and polished, except for an elongate flattened area on the outer face above, which is punctate; inner spur of posterior tibiae much longer than the outer, and about as long as half the metatarsus; abdomen long; first tergite narrower at apex than at base, almost twice as long as broad at apex, smooth and polished, with a suggestion of a median longitudinal depression near the apex; second tergite transverse, very short, at least five times as broad at apex as long down the middle, apex straight, the entire tergite perfectly smooth and polished; the remainder of the abdomen smooth and polished; ovipositor sheaths slightly longer than the abdomen, the ovipositor curved at apex. Black; tegulae and wing-bases testaceous; wings hyaline, stigma brown, except for a pale spot at base, veins colorless; legs mostly black, including all coxae and trochanters, basal half of middle femora, and the posterior femora entirely; apical half of posterior tibiae and posterior tarsi dusky, ovipositor sheaths black.

Type locality.—Utica, Mississippi.

Type.—Cat. No. 22514, U.S.N.M.

Described from one specimen in the collection of the National Museum; Ashmead's manuscript name has been used.

10. APANTELES DISPUTABILIS (Ashmead).

Urogaster disputabilis ASHMEAD, Trans. Ent. Soc. London, 1900, pt. 2, p. 286.

Habitat.—St. Vincent; Grenada; Kansas; Texas.

Host.—Unknown.

Besides two cotypes of this species, the National collection contains a single specimen from Victoria, Texas, collected by W. E. Hinds, and another from Lawrence, Kansas, taken by Hugo Kahl.

11. APANTELES PARANTHRENIDIS, new species.

Closely allied to *megathymi*, from which it differs in the abdomen being very strongly compressed at apex, in the darker membranous margins along the two basal abdominal tergites, in the ovipositor being longer and more strongly curved at tip, and in the cocoons not being imbedded in a mass of silk.

Female.—Length, 3.8 mm. Face much broader than long, punctate, but somewhat shining; vertex, temples, and cheeks coarsely roughened and dull, strongly pilose; mesoscutum very closely punctate; disk of scutellum large, distinctly longer than broad at base, flat, practically impunctate and very shining; the polished area on the lateral face of scutellum extending anteriorly almost to the base of the disk; mesopleura punctate anteriorly, polished posteriorly, with a smooth longitudinal depression; propodeum rugoso-punctate, mostly opaque, with a large, sharply-defined areola, which is not clearly separated from a rather indistinct basal median area; costulae and lateral longitudinal carinae distinct; forewing with the metacarpus longer than the stigma; radius much longer than transverse cubitus, and uniting with the latter in a very slight curve; nervellus distinctly curved toward base of wing; posterior coxae somewhat punctate above, shining; posterior femora stout; inner spur of posterior tibiae distinctly longer than the outer, and almost half as long as the metatarsus; abdomen about as long as the thorax, strongly compressed at apex; first tergite slightly broader at apex than at base, and at least one and one-half times as long as broad at apex, rugose, with a large roughened median longitudinal depression on the apical two-thirds; second tergite transverse, somewhat broader at apex than at base, and more than four times as broad at apex as long down the middle, smooth and polished, with only a few scattered punctures; remainder of abdomen smooth and shining; ovipositor prominently curved at tip, the sheaths longer than the abdomen. Black; tegulae transparent yellowish; wings hyaline, the stigma mostly colorless, with only the outline brown; all coxae black; basal trochanters blackish; remainder of legs testaceous; ovipositor sheaths black.

Male.—Posterior femora more or less blackish along the edges and at apex, also apex of posterior tibiae and most of posterior tarsi dusky; abdomen not so stout; otherwise essentially as in the female.

Cocoons.—Large, white, gregarious, but not imbedded in a mass of silk; they are formed in the burrows of the host.

Type locality.—Los Angeles County, California.

Type.—Cat. No. 22515, U.S.N.M.

Host.—*Paranthrene robiniae* Hy. Edwards.

Described from four female and four male specimens bred by A. Koebele, under Bureau of Entomology No. 132.

12. APANTELES EPINOTIAE Viereck.

Apanteles (*Apanteles*) *epinotiae* VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 614.

Habitat.—New Jersey.

Host.—*Enarmonia saliciana* Clemens (Viereck).

Known only from the type series in the United States National Museum.

13. APANTELES BALTHAZARI (Ashmead).

Urogaster balthazari ASHMEAD, Trans. Ent. Soc. London, 1900, pt. 2, p. 284.

Habitat.—Grenada.

Host.—Unknown.

This species, the type of which is in the British Museum, is known to the writer only through the original description. Apparently it can be separated from *epinotiae* only by the broader trapezoidal first abdominal tergite.

14. APANTELES LEUCOSTIGMUS (Ashmead).

Urogaster leucostigmus ASHMEAD, Trans. Ent. Soc. London, 1900, pt. 2, p. 289.

Habitat.—St. Vincent; Grenada.

Host.—Unknown.

The National Collection contains several cotypes of this species; other cotypes are in the British Museum.

15. APANTELES THURBERIAE, new species.

Closely resembles *megathymi*, from which it differs in the posterior femora being deep black in both sexes, in the black membranous margins along the first abdominal tergite, and in the strongly decurved ovipositor.

Female.—Length, 3.8 mm. Face much broader than long, uniformly shallowly punctate, and with a rather distinct median ridge just below insertion of the antennae; mesoscutum evenly and very closely punctate; disk of scutellum large, flat, and distinctly longer than broad at base, almost impunctate, polished; mesopleura evenly punctate anteriorly, polished posteriorly; propodeum rugose, with a large, sharply-defined areola crossed within by a number of strong transverse rugae, costulae usually present, apical angles prominent; posterior coxae smooth, with only a few punctures at base; posterior femora stout; inner spur of posterior tibiae distinctly longer than the outer and about half the length of the metatarsus; abdomen about as long as the thorax, broad and not compressed toward apex; first tergite broader at apex than at base, and distinctly less than one and one-half times as long as broad at apex, rugoso-punctate, with a large median longitudinal fovea on the apical two-thirds; second tergite short, transverse, longer medially than at the sides, the apical margin being strongly arcuate, at least four times as broad at apex as long down the middle, slightly broader at apex than at base, smooth and shining, like the remainder of the abdomen; hypopygium not extending beyond the apex of the last dorsal abdominal segment; ovipositor strongly decurved at tip, the sheaths about as long as the abdomen. Black; antennae entirely black; tegulae transparent-whitish; wings whitish-hyaline, stigma and veins colorless, only the outline of the stigma being brown; all coxae and trochanters, basal half of the middle femora and the hind femora entirely, black; apex of the posterior tibiae and the posterior tarsi mostly blackish; remainder of the legs reddish-testaceous; ovipositor sheaths black.

Male.—Abdomen more slender, and the first tergite not distinctly broader at apex than at base; otherwise essentially as in the female.

Cocoons.—White, solitary, and formed in the bolls.

Type locality.—Stone Cabin Canyon, Santa Rita Mountains, Arizona.

Allotype locality.—Sabino Canyon, Arizona.

Type.—Cat. No. 22516, U.S.N.M.

Host.—Bollworm on *Thurberia thespesioides.*

Described from 18 female and 12 male specimens bred by W. D. Pierce (one specimen, bred Aug. 15, 1913); A. W. Morrill (two specimens, bred Nov. 15, 1913); and C. H. T. Townsend (the remainder of the specimens, bred during late August and early September, in 1917 and 1918).

16. APANTELES MEGATHYMI Riley.

Apanteles megathymi RILEY, Trans. Acad. Sci. St. Louis, vol. 4, pt. 2, 1881, p. 304; in Scudder, Butterflies U. S., 1889, p. 1903.

Habitat.—South Carolina.

Host.—*Megathymus yuccae* Boisduval and LeConte (Riley).

Known only from the large series of cotypes in the National Collection. The species is very close to *thurberiae*, from which it can be separated by the characters noted in the key; furthermore *megathymi* is gregarious, the cocoons being packed close together in the burrow of its host, while *thurberiae* is solitary.

17. APANTELES HARTI Viereck.

Apanteles harti VIERECK, Proc. Ent. Soc. Wash., vol. 11, 1910, p. 209.

Habitat.—District of Columbia.

Host.—*Pyrausta penitalis* Grote (Viereck).

Cocoons.—White, solitary.

Known only from the type series in the United States National Museum.

18. APANTELES PHTHORIMAEAE, new species.

Female.—Length, 2.1 mm. Face smooth and shining, only indistinctly punctate, decidedly broader at the insertion of the antennae than at the base of the clypeus; clypeus distinctly separated from the face; vertex of head very smooth and shining; mesoscutum evenly punctate, shining; disk of the scutellum very flat, practically impunctate and highly polished; the broad suture at the base of the disk with only six or seven pits; mesopleura smooth and polished except anteriorly, where they are slightly punctate; propodeum areolated, the carinae very prominent, and the areas between them very smooth and shining; the sharply margined areola short-pentangular, with a strong ridge extending from its base to the base of the propodeum; radius about as long as the transverse cubitus, and making a sharp angle with the latter at the point of union; hind coxae smooth and polished, impunctate; inner spur of posterior tibiae distinctly longer than the outer, but not quite half as long as the metatarsus; abdomen almost as long as the thorax, and broad; first and second abdominal tergites ruguloso striate, the second more finely so; first tergite narrowing slightly toward apex, twice as long as broad at apex, and possessing a long, very slender, median longitudinal depression on the apical half; second tergite short, transverse, much broader at apex than at base and four or five times as broad at apex as long down the middle, the posterior margin straight, or at least not arcuate; lateral membranous margins along the two basal abdominal tergites broad; the dorsal abdominal segments beyond the second smooth and polished; ovipositor sheaths half the length of the abdomen. Black; scape of the antennae mostly reddish-testaceous; tegulae and wing-bases, also the legs, except the posterior coxae, which are black on the basal two-thirds, testaceous; ovipositor sheaths black.

Type locality.—Baton Rouge, Louisiana.

Type.—Cat. No. 22517, U.S.N.M.

Host.—*Phthorimaea glochinella* Zeller.

One female specimen bred by J. L. E. Lauderdal, November 1, 1916, and recorded in the Bureau of Entomology under Chittenden No. 4269-1.

19. APANTELES ACROBASIDIS, new species.

Closely allied to *phthorimaeae*, from which it differs in its larger size, in the broader first abdominal tergite, which is not narrowed posteriorly, in the darker posterior legs, and in the longer ovipositor.

Female.—Length, 2.8 mm. Face much broader than long, about as broad at base of clypeus as at insertion of antennae, very minutely shallowly punctate and shining; clypeus distinctly separated from face; vertex weakly punctate, rather opaque, mesoscutum shining, evenly, shallowly punctate; disk of scutellum large, flat, truncate at apex, smooth and polished, impunctate; mesopleura mostly polished;

propodeum with a very sharply margined short and broad areola, also with strongly elevated costulae and lateral longitudinal carinae, the areas between the ridges weakly punctate and strongly shining; radius of forewing only slightly longer than transverse cubitus and uniting with it in an even curve; posterior coxae smooth and shining; inner spur of posterior tibiae longer than the outer, but not half as long as the metatarsus; abdomen almost as long as the thorax, and very broad; first tergite large, parallel-sided, or very slightly broader at apex than at base, a little longer than broad, and coarsely rugose, with a large shining median longitudinal fovea on the apical half; second tergite short and broad, more than four times as broad at apex as long down the middle, and longer medially than at the sides, the posterior margin being arcuate, this tergite very feebly rugulose; suturiform articulation broad and foveolate; remainder of the abdomen very smooth and shining; ovipositor sheaths about as long as the abdomen. Black; scape yellowish; wings hyaline, the veins brown; legs, except all coxae, which are black, and the apical third of the posterior femora, apical half of posterior tibiae, and the posterior tarsi, which are blackish, testaceous; venter of the abdomen black; ovipositor sheaths black.

Type locality.—College Park, Maryland.

Type.—Cat. No. 22518, U.S.N.M.

Host.—(?) *Acrobasis caryae* Grote, on English walnut.

One female specimen reared by A. B. Gahan, August 17, 1912.

20. APANTELES ENSIGER (Say).

Microgaster ensiger SAY, Boston Journ. Nat. Hist., vol. 1, pt. 3, 1836, p. 260; LeConte, Writ. of Th. Say, Entom., vol. 2, 1859, p. 711.

Apanteles nipmuckorum VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Surv., 1916, pp. 191, 200.

Habitat.—Indiana; Illinois; Connecticut; New York; District of Columbia; New Hampshire; Canada.

Host.—(?) *Crambus zeellus* Fernald.

The type of this species has been lost, but there is probably no doubt as to the identity of the species. A female specimen in the United States National Museum, bearing Ashmead's label, upon which there is a neotype notation by Viereck, has been considered typical by the writer. There can be no question that *nipmuckorum* Viereck is *ensiger* Say.

The National Collection contains specimens from the following localities: Long Island and Oswego, New York; Ottawa, Canada; Washington, District of Columbia; Algonquin, Illinois; and Mount Washington, New Hampshire. One specimen bears the number 3679° and is labeled as having been reared from *Crambus zeellus* Fernald, June 22, 1888.

21. APANTELES NINIGRETORUM Viereck.

Apanteles (*Apanteles*) *ninigretorum* VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, pp. 191, 200.

Habitat.—Connecticut.

Host.—Unknown.

Type apparently lost. There is nothing in the original characterization which will separate this species from *ensiger*.

22. APANTELES XANTHOPUS (Ashmead).

Urogaster xanthopus ASHMEAD, Trans. Ent. Soc. London, 1900, pt. 2, p. 288.

Habitat.—St. Vincent.

Host.—Unknown.

Known only from the cotype material in the National Collection; other cotypes are in the British Museum. It is closely allied to *ensiger*, from which it can be readily separated by the smooth and polished second abdominal tergite.

23. APANTELES LEUCOPUS (Ashmead).

Urogaster leucopus ASHMEAD, Trans. Ent. Soc. London, 1900, pt. 2, p. 287.

Habitat.—St. Vincent; Grenada.

Host.—Unknown.

Only the single cotype specimen in the National Museum has been seen by the writer; other cotypes are in the British Museum. The species is readily distinguished from *xanthopus* and *pinos* by the black abdomen.

24. APANTELES PINOS (Cresson).

Microgaster pinos CRESSON, Proc. Ent. Soc. Philad., vol. 4, 1865, p. 67.

Habitat.—Isle of Pines, West Indies.

Host.—Unknown.

Placed in the key on the basis of the original description. The type, which is in the Academy of Sciences at Philadelphia, has not been seen.

25. APANTELES BETHELI Viereck.

Apanteles (*Apanteles*) *betheli* VIERECK, Proc. U. S. Nat. Mus., vol. 39, 1910, p. 402.

Habitat.—Colorado.

Host.—(?) *Argyresthia*, species on oak (Viereck).

Known only from the three specimens constituting the type series in the National Collection.

26. APANTELES CALIFORNICUS, new species.

Very similar to *betheli*, from which it is distinguished by the more smooth and shining propodeum, by the areola not being sharply circumscribed, and by the lighter legs.

Female.—Length, 2.8 mm. Face narrowing below so that it is narrower at base of clypeus than at the insertion of the antennae, no broader than long, and somewhat punctate and opaque; vertex, temples, and cheeks likewise weakly punctate and opaque; mesoscutum finely uniformly punctate and dull; disk of scutellum longer than broad at base, flat, and smooth, with only a few indistinct punctures at the sides, and rather shining; suture at base of scutellar disk so narrow that the numerous pits within can scarcely be distinguished; the smooth and polished area on the lateral face of scutellum not extending anteriorly halfway to the base of the disk; mesopleura smooth and very highly polished; propodeum somewhat punctate and shining, but with a shallow areola, which is not sharply margined: apical angles of propodeum projecting strongly; radius of forewing much longer than transverse cubitus; posterior coxae somewhat punctate, rather shining, a distinct oval flattened or sunken area at base above; spurs of posterior tibiae equal in length and not half as long as the metatarsus; abdomen very slender, as long as the thorax, almost four times as long as its extreme breadth; first tergite parallel-sided, very slender, at least twice as long as broad at apex, very finely ruguloso-striate, with a slightly depressed, shining, median longitudinal area on apical half; second tergite transverse, more than three times as broad as long down the middle, and longer medially than at the sides, the posterior margin being decidedly curved, broader at apex than at base, and very finely ruguloso-striate, like the first tergite; remainder of the abdomen smooth and shining; hypopygium sword-like, very slender and strongly projecting; ovipositor sheaths slender and longer than the abdomen. Black; antennae entirely black; tegulae, all coxae, posterior trochanters, both edges of posterior femora, apical third of posterior tibiae, and all of the posterior tarsi, also ovipositor sheaths, and the venter of the abdomen, black or blackish.

Male.—Essentially as in the female, except that the second abdominal tergite is relatively longer and not so broad.

Type locality.—Yosemite National Park, California.

Type.—Cat. No. 22520, U.S.N.M.

Host.—*Recurvaria milleri* Busck.

Described from 11 female and 1 male specimens bred July 31, 1917, by J. E. Patterson and recorded in the Bureau of Entomology under Hopkins U. S. No. 13322^h.

27. APANTELES PSEUDOGLOSSAE, new species.

Female.—Length, 2.7 mm. Face much broader than long, punctate, shining; clypeus distinctly separated from face; a conspicuous short median ridge on face just below insertion of antennae; vertex and temples closely punctate, dullish; disk of scutellum slightly convex, about as long as broad at base, almost impunctate, and strongly shining; the posterior polished area on lateral face of scutellum extending forward to about the middle of the disk; mesopleura shining, punctate below and anteriorly; propodeum rugose, with a large, sharply margined, somewhat diamond-shaped areola that is shining within; costulae distinct; apical angles of propodeum prominent; forewing with radius much longer than transverse cubitus; nervellus strongly curved toward base of wing behind; posterior coxae somewhat punctate, shining; inner spur of posterior tibiae much longer than the outer and about half the length of the metatarsus; abdomen hardly as long as the thorax, rather broad beyond the first segment; first tergite long, slender, about as broad at apex as at base, the sides slightly rounded, more than twice as long as broad at apex, rugose, and with a large median longitudinl shining fovea on apical half; second tergite transverse, the sides oblique, so that the plate is broader at apex than at base, longer medially than at the sides, the posterior margin being arcuate, about four times as broad at apex as long down the middle, and perfectly smooth and shining, like the remainder of the abdomen; lateral membranous margins along the apical half of the first tergite and along the entire length of the second, very broad; ovipositor sheaths slightly less than half the length of the abdomen. Black; antennae entirely black; tegulae testaceous; wings hyaline, the stigma and veins uniformly pale brown; legs testaceous, except all coxae, which are black, and the apex of the posterior tibiae and the posterior tarsi, which are dusky; ovipositor sheaths black.

Male.—Abdomen more slender than in the female, the basal abdominal tergite a little narrower at apex than at base, and the second tergite about as broad at base as long down the middle.

Type locality.—Rockville, Maryland.

Type.—Cat. No. 22519, U.S.N.M.

Host.—*Epizeuxis lubricalis* Geyer.

Three female and four male specimens bred under Bureau of Entomology No. 2667. Ashmead's manuscript name has been adopted.

28. APANTELES HYALINUS (Cresson).

Microgaster hyalinus CRESSON, Proc. Ent. Soc. Philad., vol. 4, 1865, p. 68.
Urogaster hyalinus ASHMEAD, Trans. Ent. Soc. London, 1900, pt. 2, p. 283.

Habitat.—Cuba.

Host.—Unknown.

No specimen of this species, the type of which is in the Academy of Sciences at Philadelphia, has been seen by the writer. It seems that there can be no doubt that Ashmead had Cresson's species in mind when he included *hyalinus* in a key to the West Indian species of *Urogaster.*

29. APANTELES VULGARIS (Ashmead).

Urogaster vulgaris Ashmead, Trans. Ent. Soc. London, 1900, pt. 2, p. 286.

Habitat.—St. Vincent.

Host.—Unknown.

Represented in the National Collection by four cotype specimens; other cotypes are in the British Museum.

30. APANTELES INSULARIS, new name.

Urogaster grenadensis Ashmead, Trans. Ent. Soc. London, 1900, pt. 2, p. 285 (not *Apanteles grenadensis* Ashmead, same reference, p. 277).

Habitat.—St. Vincent; Grenada.

Host.—Unknown.

The National Collection contains a single cotype specimen of this species.

The name *grenadensis* is preoccupied by *Apanteles grenadensis* Ashmead.

31. APANTELES RHOMBOIDALIS (Ashmead).

Urogaster rhomboidalis Ashmead, Trans. Ent. Soc. London, 1900, pt. 2, p. 290.

Habitat.—St. Vincent.

Host.—Unknown.

There are three cotype specimens of this species in the National Museum; these have furnished the characters used in the key. Other cotypes are in the British Museum.

32. APANTELES MERIDIONALIS (Ashmead).

Urogaster meridionalis Ashmead, Trans. Ent. Soc. London, 1900, pt. 2, p. 285.

Habitat.—St. Vincent; Grenada.

Host.—Unknown.

Known to the writer only from the single cotype in the National Collection. The British Museum collection contains another cotype.

33. APANTELES CONANCHETORUM Viereck.

Apanteles (*Apanteles*) *conanchetorum* Viereck, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, pp. 191, 199.

Habitat.—Connecticut.

Host.—Unknown.

Known only from the type which is in the collection of the Connecticut Agricultural Experiment Station, at New Haven, Connecticut.

34. APANTELES PICEOVENTRIS, new name.

Urogaster solitarius ASHMEAD, Trans. Ent. Soc. London, 1900, pt. 2, p. 287 (not *solitarius* Ratzeburg, Ichn. Forstins., vol. 3, 1844, p. 25.)

Habitat.—Grenada.

Host.—Unknown.

The writer has seen no representative of this species the type of which is in the British Museum. It is placed in the key solely upon the characters given in the original description.

35. APANTELES ACICULATUS (Ashmead).

Urogaster aciculatus ASHMEAD, Trans. Ent. Soc. London, 1900, pt. 2, p. 289.

Habitat.—Grenada.

Host.—Unknown.

The type of this species is in the British Museum and has not been examined. The species has been given its place in the key on the basis of the original description.

36. APANTELES CARPATUS (Say).

Microgaster carpata SAY, Boston Journ. Nat. Hist., vol. 1, pt. 3, 1836, p. 263; LeConte, Writ. of Th. Say, Entom., vol. 2, 1859, p. 714.

Apanteles carpatus Say, CHITTENDEN, U. S. Div. Ent. Bull. 8, new. ser., 1897, p. 42.

Apanteles ensiger Say=(*Microgaster carpatus* Say) DALLA TORRE, Catalogus Hymenopterorum, vol. 4, 1898, p. 169.

Apanteles (*Apanteles*) *carpatus* Say, VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, pp. 191, 200.

Habitat.—Widely distributed over at least the eastern half of the United States.

Hosts.—*Tinea pellionella* Linnaeus; *Trichophaga tapetiella* Linnaeus.

The type of this species has been lost. The writer's conception of the species is based upon specimens in the National Collection determined by Ashmead, and which appear to agree in every respect with the original description. There are in the United States National Museum numerous representatives of the species, for the most part consisting of collected material, but including also the following: A series bearing Bureau of Entomology No. 3638–^{01}, reared from *Tinea pellionella;* two specimens reared by W. D. Kearfott from the same host; and a series from *Trichophaga tapetiella*, bearing the number 240^{x}, without further data.

37. APANTELES FORBESI Viereck.

Apanteles (*Apanteles*) *forbesi* VIERECK, Proc. Ent. Soc. Wash., vol. 11, 1910, p. 208.

Habitat.—Illinois; Indiana; Iowa; Kansas; Maryland; Connecticut; New York; Massachusetts; Kentucky; Oregon; apparently very widely distributed.

Hosts.—*Cirphis unipuncta* Haworth; *Polia renigera* Stephens; *P. stricta* Walker; *Feltia* sp.; " cutworms."

Cocoons.—White; solitary.

The National Collection contains besides the type series the following material: Two specimens from Hagerstown, Maryland, reared from *Feltia*, species by W. E. Pennington; one specimen from the same locality, reared by Mr. Pennington, from *Polia renigera* Stephens; four specimens from Forest Grove, Oregon, reared by L. P. Rockwood from *Polia stricta* Walker, under Webster No. 18460; one specimen from Linton, Indiana, reared from cutworm by S. L. Mason, Lafayette Cage No. E105e; one specimen from Buck Creek, Indiana, J. J. Davis, collector, cage No. D200be; one specimen from Lafayette, Indiana, J. J. Davis, collector, cage No. D195bg. In addition, the writer has seen one specimen in the Cornell University collection, taken at Ithaca, New York; also one specimen reared from the army worm by H. Garman, at Lexington, Kentucky, in the collection of the Kentucky Agricultural Experiment Station; and several specimens in the collections of the Agricultural Experiment Stations of Iowa and Kansas.

38. APANTELES EPHESTIAE Baker.

Apanteles ephestiae BAKER, Ent. News, vol. 6, 1895, p. 201.

Habitat.—Colorado.

Host.—*Ephestia kuehniella* Zeller (Baker).

Represented in the National Collection by five cotype specimens. The species structurally and biologically resembles *carpatus* Say, from which it differs only in the wings being hyaline rather than whitish, in the veins of the forewing being brown, and in the stigma being longer and not so broad, also in the darker posterior femora.

39. APANTELES EDWARDSII Riley.

Apanteles edwardsii RILEY, Scudder, Butterflies U. S., 1889, p. 1901.

Apanteles ensiger Say=(*Apanteles edwardsii* Riley) DALLA TORRE, Catalogus Hymenopterorum, vol. 4, 1898, p. 169.

Apanteles (*Apanteles*) *edwardsii* Riley, VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, pp. 190, 199.

Habitat.—Connecticut.

Host.—*Vanessa atalanta* Linnaeus (Riley).

Cocoons.—White; solitary.

Known only from the type series in the National Collection.

40. APANTELES PLESIUS Viereck.

Apanteles (*Apanteles*) *plesius* VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 615.

Habitat.—New Jersey.

Host.—"Larva on white oak" (Viereck).

Known only from the unique type in the United States National Museum; the abdomen of this specimen is missing.

41. APANTELES POLYCHROSIDIS Viereck.

Apanteles (*Apanteles*) *polychrosidis* VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 615.

(*Apanteles polychrosidis* Viereck)=*Apanteles fumiferanae* Viereck, GAHAN, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 121.

(?) (*Microgaster*) *Apanteles clavatus* PROVANCHER, Natural. Canad., vol. 12, 1881, p. 196.

Habitat.—District of Columbia; Pennsylvania; New York; ?Canada.

Hosts.—*Polychrosis liriodendrana* Kearfott; *P. viteana* Clemens; *Gracilaria*, species.; *Cacoecia rosaceana* Harris.

Cocoons.—White; solitary.

Besides the type series the National Collection contains the following representatives of this species: Six specimens reared by R. A. Cushman from the grape berry moth at North East, Pennsylvania, under Quaintance No. 11081; two specimens from the same host, *Polychrosis viteana*, and the same locality, under Quaintance No. 10907; one specimen reared by D. Isely from a leaf-miner on *Prunus serotina*, at North East, Pennsylvania, under Quaintance No. 10961; one specimen, without locality label, reared from *Cacoecia rosaceana* under Bureau of Entomology No. 46°; several specimens reared by C. R. Ely at Washington, District of Columbia, from *Gracilaria*, species. In addition, the writer has seen a number of specimens in the Cornell University collection, which were collected at Ithaca and McLean, New York.

In the opinion of the writer, *polychrosidis* is distinct from *fumiferanae*, being distinguished from that species by the yellow tegulae, by the smoother and more polished disk of scutellum, by the indistinctly punctate mesoscutum, and by the usually darker legs. Apparently it is identical with *clavatus* Provancher, agreeing with Provancher's description, also with notes on *clavatus* made by A. B. Gahan after an examination of the type, which remains in the Provancher collection at Quebec. However, since the type specimen is badly broken and in generally poor condition, the synonomy is queried. Should *polychrosidis* and *clavatus* prove to be identical, *clavatus* would be the valid name.

42. APANTELES CANARSIAE Ashmead.

Apanteles canarsiae ASHMEAD, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 127.

Apanteles (Apanteles) housatannuckorum VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, pp. 189, 198.

Apanteles (Apanteles) maquinnai VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, pp. 190, 199.

Habitat.—Illinois; Virginia; District of Columbia; Connecticut; Iowa.

Hosts.—*Psorosina hammondi* Riley (Ashmead); *Desmia funeralis* Hübner.

Cocoons.—White; solitary.

The type material of *canarsiae* has been carefully compared with that of the two species listed in the synonymy; and the writer is of the opinion that the three names have been applied to the same species.

In addition to the type series of *canarsiae* there are in the National collection the following representatives of this species: Three specimens reared by J. F. Strauss from *Desmia funeralis*, at Washington, District of Columbia, under Quaintance No. 5534; two specimens reared by R. L. Webster from *Psorosina hammondi*, at Des Moines, Iowa; one specimen bred from white cocoons on Desmia, at Herndon, Virginia.

43. APANTELES FUMIFERANAE Viereck.

Apantales fumiferanae VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 139.

Habitat.—Canada; Oregon; Massachusetts; Maine.

Host.—*Harmologa fumiferana* Clemens (Viereck).

Cocoons.—White; solitary.

Besides the type series the National Collection contains one specimen of this species bearing the following data: Ashland, Oregon, C. Heinrich, collector, Hopk., U. S. No. 12522^{c}, from Tortricid on *Pinus lambertiana;* and one specimen from Boston, Massachusetts, A. D. Hopkins, collector, Hopk. U. S. No. 9498^{e1}. Through the kindness of Dr. Edith M. Patch the writer has also seen one specimen from the collection of the Maine Agricultural Experiment Station, which was reared from the spruce bud moth at Orono, Maine, June 28, 1912.

44. APANTELES TRACHYNOTUS Viereck.

Apanteles (Apanteles) trachynotus VIERECK, Proc. U. S. Nat. Mus., vol. 42 1912, p. 616.

Habitat.—New Jersey; Delaware; Connecticut; New York; Nova Scotia.

Host.—*Pegomyia vicina* has been given as the host of this species, on the authority of J. B. Smith, but this record is probably incorrect; no other species of the genus, so far as known, has been reared from the larva of any order other than Lepidoptera, and it is very doubtful if parasitism by *Apanteles* extends to other orders.

There are in the National Collection, besides the type series, six specimens of this species, three of which were taken at Castle Rock, Delaware; the remaining three are without locality labels, but were doubtless collected in Illinois, since all three specimens bear Illinois numbers. The writer has also seen several male specimens in the collection of Cornell University, which were collected at Ithaca and McLean, New York. In the same collection are two males, collected at Truro, Nova Scotia, by Dr. R. Matheson, in July, 1913. The female of this species is unknown.

45. APANTELES MIANTONOMOI Viereck.

Apanteles (Apanteles) miantonomoi VIERECK, Bull. 22, Connecticut State Geol. and Nat. Hist. Survey, 1916, pp. 190, 198.

Apanteles (Apanteles) pequodorum VIERECK, Bull. 22, Connecticut State Geol. and Nat. Hist. Survey, 1916, pp. 190, 198.

Habitat.—Connecticut.

Host.—Unknown.

Known only from the types in the Connecticut Agricultural Experiment Station, at New Haven, Connecticut, and one paratype in the United States National Museum.

After a careful study of the types of *miantonomoi* and *pequodorum* the writer is convinced that they represent the same species.

46. APANTELES MELANOPUS Viereck.

Apanteles (Apanteles) melanopus VIERECK, Bull. 22, Connecticut State Geol. and Nat. Hist. Survey, 1916, pp. 190, 198.

Habitat.—Connecticut.

Host.—Recorded as bred from pupae of the cabbage butterfly; but, since the species of *Apanteles* are evidently exclusively parasitic on the larvae stage of their hosts, this record is open to doubt.

The species is known to the writer only from the type in the Connecticut Agricultural Experiment Station and a single paratype in the United States National Museum.

47. APANTELES CACOECIAE Riley.

Apanteles cacoeciae RILEY, Trans. Acad. Sci., St. Louis, vol. 4, pt. 2, 1881, p. 306.—SLINGERLAND and CROSBY, Manual of Fruit Insects, 1914, p. 58.

Habitat.—Missouri; New York; Maryland; Michigan; Canada.

Hosts.—*Cacoecia semiferana* Walker (Riley); *Tortrix*, species; *Paedisca*, species; (?) *Acrobasis caryae* Grote; *Bucculatrix pomifoliella* Clemens (Slingerland and Crosby).

Cocoons.—White, thin; firmly held together in small groups of three to six.

In addition to the type series the National Collection contains the following specimens of this species: Two specimens reared by T. H. Soden from *Tortrix*, species at Cohoes, New York, under Quaintance No. 9269; 13 specimens bearing Bureau of Entomology No. B212°, parasitic on *Paedisca* on *Solidago lanceolata;* 5 specimens reared by A. B. Gahan at College Park, Maryland, from cocoons on English walnut and believed to have been parasitic on *Acrobasis caryae;* 7 specimens collected at Agricultural College, Michigan; 2 specimens from southern Quebec, Canada; and 1 specimen from Monroe County, New York, reared from an unknown leaf-roller.

48. APANTELES LACTEICOLOR Viereck.

Apanteles (*Apanteles*) *lacteicolor* VIERECK, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 475.

Apanteles lacteicolor VIERECK, Muesebeck, Journ. Agr. Research, vol. 14, 1918, p. 194.

Habitat.—Europe; New England.

Hosts.—*Euproctis chrysorrhoea* Linnaeus; *Porthetria dispar* Linnaeus; *Acronycta hasta* Guenée (Muesebeck); *Hyphantria textor* Drury.

Cocoons.—White; solitary.

In addition to the type series in the National Collection, the writer has seen several hundred specimens at the Gipsy Moth Laboratory, at Melrose Highlands, Massachusetts.

49. APANTELES DIATRAEAE, new species.

Female.—Length, 2mm. Face punctate and shining; vertex strongly shining; antennae shorter than the body, mesoscutum flat, weakly punctate anteriorly, impunctate and polished behind; disk of scutellum wholly impunctate and highly polished; the lateral face of scutellum with the posterior polished area small, semicircular, and not extending anteriorly half way to the base of the disk; mesopleura exceedingly highly polished, with a very shallow polished depression posteriorly; propodeum finely roughened, shining, and with an elongate areola, which is margined by strong carinae, and is apparently confluent with the basal median area; radius of fore wing slightly longer than transverse cubitus, and uniting with the latter in a sharp angle; nervellus curving very strongly behind toward base of wing; posterior coxae smooth and shining; inner spur of posterior tibiae slightly longer than the outer, and almost half as long as the metatarsus; first abdominal tergite very narrow and parallel-sided, about as broad at apex as at base, the apical angles acute, the tergite weakly roughened, and with a conspicuous shining median fovea on the posterior half; second tergite trapezoidal, as broad at base as first tergite is broad at apex, and a little broader at apex than at base, perfectly smooth and very highly polished like the remainder of the abdomen; ovipositor sheaths about half the length of the abdomen, sharply pointed at apex. Black; antennae brownish; tegulae black; wings hyaline, with the stigma and veins dark brown; legs entirely black, except the apex of fore femora and the fore tibiae and tarsi, which are rather yellowish, and the middle tibiae and tarsi, which are dusky; abdomen entirely black, including the membranous margins along the first and second abdominal tergites and the entire venter.

Male.—Antennae very much longer than in the female; otherwise essentially as in that sex.

Cocoons.—Dirty whitish, and cemented together in a long slender row, but not surrounded by loose silk.

Type locality.—Mercedes, Cuba.

Type.—Cat. No. 22521, U.S.N.M.

Host.—*Diatraea saccharalis* Fabricius.

Described from nine female and four male specimens bred by T. E. Holloway, September, 1918.

50. APANTELES LASPEYRESIAE Viereck.

Apanteles (*Apanteles*) *laspeyresiae* Viereck, Proc. U. S. Nat. Mus., vol. 44, 1913, p. 556.

Habitat.—California.

Host.—(*Laspeyresia*) *Carpocapsa toreuta* Grote (Viereck).

Known to the writer from the type series, and a large amount of additional material in the United States National Museum, all reared from the same host in the same general locality.

51. APANTELES TISCHERIAE Viereck.

Apanteles (*Apanteles*) *tischeriae* Viereck, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 140.

Habitat.—Delaware; Ohio; Connecticut.

Host.—*Tischeria malifoliella* Clemens.

Besides the type series the National Collection contains a single specimen from Wallingford, Connecticut, reared from *Tischeria malifoliella* by B. A. Porter, under Quaintance No. 16540, and a large series from Waterville, Ohio, reared in the insectary of the Agricultural College at Wooster, Ohio, under No. 3124, host and collector not indicated.

52. APANTELES ARISTOTELIAE Viereck.

Apanteles (*Apanteles*) *aristoteliae* VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 613.

Apanteles (*Apanteles*) *gelechiae* VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 615.

Habitat.—New Jersey; Connecticut; Pennsylvania; Michigan.

Hosts.—*Aristotelia fungivorella* Clemens (Viereck); *Gelechia trialba-maculella* Chambers (Viereck); *Gelechia confusella* Chambers; *Gelechia*, species.

In the opinion of the writer these two species can not be held distinct. The type of both species have been carefully studied.

In addition to the type material the National Collection contains specimens from Danville, Pennsylvania, reared under Hopk. U. S. No. 13908^{d1}, by A. B. Champlain, from a lepidopteron boring in pine cones; one specimen reared at Benton Harbor, Michigan, by H. G. Ingerson from *Gelechia confusella*, under Quaintance No. 12542; and a series also reared at Benton Harbor, Michigan, by H. G. Ingerson from *Gelechia* species under several Quaintance numbers.

53. APANTELES TERMINALIS (Gahan).

Pseudapanteles terminalis ASHMEAD MS., in Smith's Insects of New Jersey, 1899, p. 593.

Apanteles (*Pseudapanteles*) *terminalis* GAHAN, Proc. Ent. Soc. Wash., vol. 14, 1912, p. 2.

Habitat.—New York; Florida; Maryland; Kentucky; Illinois; Texas.

Host.—Unknown.

There are in the National Museum, besides the type series, one specimen collected at Victoria, Texas, by W. E. Hinds, and one specimen from southern Illinois collected by Charles Robertson. The writer has also seen three fine specimens of this species in the collection of the Kentucky Agricultural Experiment Station, at Lexington, Kentucky.

54. APANTELES FEMUR-NIGRUM (Provancher).

Microgaster femur-nigrum PROVANCHER, Addit. faun. Canad. Hymenop., 1886, pp. 139, 142.

Apanteles femur-nigrum PROVANCHER, Addit. faun. Canad. Hymenop., 1888, p. 388.

Habitat.—Canada.

Host.—Unknown.

Type in the Provancher collection, at the Museum of Public Instruction at Quebec, and not seen by the writer. The species has been given its position in the key on the basis of the original description and notes by A. B. Gahan after a study of the type.

55. APANTELES PARALELLIS (Ashmead).

Protapanteles paralellis ASHMEAD, Trans. Ent. Soc. London, 1900, pt. 2, p. 281.

Habitat.—St. Vincent.

Host.—Unknown.

Type in the British Museum and not examined; apparently the species is distinct and can be separated by the characters given in the table.

56. APANTELES NIGROVARIATUS, new species.

Female.—Length, 2.5 mm. Face closely, shallowly punctate and shining, hardly as broad at base of clypeus as long; vertex, temples, and cheeks closely punctate and opaque; antennae at least as long as the entire insect; mesoscutum uniformly closely shallowly punctate; disk of scutellum rather flat, and smooth, with only a few weak punctures; propodeum smooth and polished, but with a prominent median longitudinal carina extending from base to apex; mesopleura smooth and polished except for some scattered punctures anteriorly; forewing with the metacarpus much longer than the stigma, and the radius somewhat longer than the transverse cubitus; inner spur of posterior tibiae much longer than the outer, and as long as half the metatarsus; abdomen with the two basal tergites ruguloso-punctate, the third and following tergites smooth; first tergite about as broad at apex as at base, broadest medially, the sides being slightly curved outwardly, and at least one and one-half times as long as broad at apex; second tergite short, transverse, much broader than the first tergite, and at least four times as broad as long, the apical margin straight; ovipositor sheaths almost or quite two-thirds the length of the abdomen. Mostly red in color; head largely black, the antennae and face rather reddish-black; mesosternum dark reddish-brown; metanotum and propodeum black; legs dark reddish-testaceous; ovipositor sheaths black.

Type locality.—Mount Holly Springs, Pennsylvania.

Type.—Cat. No. 22522, U.S.N.M.

Described from one female specimen collected by R. M. Fouts, July 28, 1918.

57. APANTELES CONSIMILIS (Viereck).

Pseudapanteles consimilis ASHMEAD MS., in Smith's Insects of New Jersey, 1899, p. 593.

Apanteles (*Pseudapanteles*) *consimilis* VIERECK, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 177.

Habitat.—New York.

Host.—Unknown.

Known to the writer only from the unique type (female) in the United States National Museum, and two male specimens in the collection of Cornell University; these last were collected at McLean, New York.

58. APANTELES COCKERELLI, new species.

Female.—Length, 3 mm. Head, rostriform; face, closely minutely punctate and opaque; antennae about as long as the body; mesoscutum closely finely punctate; scutellum with the disk smooth medially, sparsely minutely punctate at the sides, and the lateral face with the posterior polished area large, but rounded in front, and not reaching two-thirds of the distance to the base of the disk; mesopleura wholly polished, shining; propodeum wholly impunctate, exceedingly highly polished; forewing with the radius much longer than the transverse cubitus; nervellus curving strongly behind toward base of wing; posterior coxae smooth and shining; inner spur of posterior tibiae slightly longer than the outer, but not half the length of the metatarsus; abdomen at least as long as the thorax; first tergite narrower at apex than at base, entirely smooth and highly polished; second tergite short and transverse, as broad at base as first tergite is broad at apex, and much broader at apex than at base, defined laterally by sharp oblique grooves, and more than three times as broad at apex as long down the middle, smooth and shining; membranous margins along the apical third of the first tergite and the entire length of the second broad; abdomen beyond the second tergite smooth and slightly opaque; ovipositor sheaths at least as long as the abdomen, slender; hypopygium projecting somewhat beyond the apex of the abdomen. Black; antennae and tegulae black; wings whitish-hyaline, with the stigma and the netacarpus brown, the veins colorless; legs mostly black except the apex of the fore femora, the entire fore tibiae and the basal half of the middle and hind tibiae, which are pale; abdomen, including the membranous margins along the two basal tergites, and the entire venter, black.

Type locality.—New Mexico.

Type.—Cat. No. 22523, U.S.N.M.

Described from one specimen collected by T. D. A. Cockerell, June 24, 1896.

59. APANTELES DAKOTAE, new species.

Very similar to *cockerelli*, but differs in the punctate propodeum and two basal abdominal tergites, and in the ovipositor sheaths being broader and only about two-thirds the length of the abdomen.

Female.—Length, 3.5 mm. Head rostriform; malar space long; face rather shagreened, shining; mesoscutum very minutely, closely punctate, rather shining; scutellum with the disk uniformly minutely punctate, and the lateral face with the posterior polished area large but rounded anteriorly and not extending nearly to the base of the disk; propodeum weakly punctate, without an areola or any carinae; forewing with the stigma large, the metacarpus decidedly longer than the stigma, and the radius curved and about twice as long as the transverse cubitus; posterior coxae smooth and shining; spurs of posterior tibiae equal in length and almost half as long as the metatarsus; abdomen broad, the first tergite very large and very broad at base, punctate, more closely so in the middle, and without the median longitudinal depression present in many species; second tergite short, transverse, two and one-half times as broad at base as long down the middle, and at least four times as broad at apex as long down the middle, weakly punctate, and defined laterally by sharp oblique furrows; remainder of the abdomen smooth and shining; ovipositor sheaths broad, truncate at apex, and two-thirds the length of the abdomen. Black; antennae and tegulae black; wings whitish-hyaline, the stigma dark brown, and the veins colorless; legs, except the apex of the fore and middle femora, all the tibiae entirely and most of all tarsi, which are testaceous, black; abdomen wholly black, including the broad membranous margins along the two basal tergites and the entire venter.

Type locality.—Cedar Pass, South Dakota.

Type.—Cat. No. 22524, U.S.N.M.

Described from one specimen collected by W. H. Ober.

60. APANTELES ANNULICORNIS (Ashmead).

Pseudapanteles annulicornis ASHMEAD, Trans. Ent. Soc. London, 1900, pt. 2, p. 292.

Habitat.—St. Vincent.

Host.—Unknown.

Represented in the United States National Museum by two cotype specimens; other cotypes are in the British Museum.

61. APANTELES BRUNNEUS (Ashmead).

Pseudapanteles brunneus ASHMEAD, Trans. Ent. Soc. London, 1900, pt. 2, p. 292.

Habitat.—St. Vincent.

Host.—Unknown.

Type in the British Museum and not examined; but the species is apparently distinct.

62. APANTELES SESIAE Viereck.

Apanteles (*Pseudapanteles*) *sesiae* VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 146.

Habitat.—Virginia; Florida.

Host.—(*Sesia*) *Synanthedon scitula* Harris (Viereck).

The National Collection contains in addition to the type series a single specimen of this species from Jacksonville, Florida.

63. APANTELES CHOREUTI Viereck.

Apanteles (*Pseudapanteles*) *choreuti* VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 627.

Habitat.—New Jersey; Virginia; Florida.

Host.—*Choreutis carduiella* Kearfott (Viereck); *Desmia funeralis* Hübner.

Besides the types there is in the United States National Museum a single specimen of this species reared by R. A. Cushman at Vienna, Virginia, from *Desmia funeralis* under Quaintance No. 7883. The writer has also seen one male specimen in the Cornell University collection, which was collected by J. C. Bradley, at Sanford, Florida, March 28, 1914.

64. APANTELES SANCTI-VINCENTI Ashmead.

Apanteles sancti-vincenti ASHMEAD, Trans. Ent. Soc. London, 1900, pt. 2, p. 279.

Habitat.—St. Vincent.

Host.—Unknown.

The type of this species is in the British Museum and has not been seen; the species has been given its position in the key on the basis of the original description.

65. APANTELES CINCTIFORMIS (Viereck).

Apanteles (*Protapanteles*) *cinctiformis* VIERECK, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 176.

Habitat.—Virginia; Michigan; Iowa; New York; Canada.

Host.—Unknown.

The National Collection contains, in addition to the type, the following specimens of this species: One specimen from Agricultural College, Michigan, host not indicated; one from Ottawa, also without further data; and one from the Iowa Agricultural Experiment Station, bearing Accession Cat. No. 776 of that institution. The writer has also seen eight female specimens in the collection of the Department of Entomology at Cornell University. These specimens were collected at Slaterville, Ithaca, and McLean, New York.

66. APANTELES PAPAIPEMAE, new species.

Female.—Length, 2.5 mm. Face but little broader than long, indistinctly punctate and strongly shining; vertex and temples practically impunctate and shining; antennae about as long as the body; mesoscutum very minutely punctate and strongly shining; scutellum with the disk practically impunctate, and with the lateral face mostly striate, the posterior polished area being very small; mesopleura only very weakly punctate anteriorly, smooth and polished behind; propodeum dull, weakly punctate on the anterior third, finely rugulose on the remainder, and with a sharp median longitudinal carina from base to apex; metacarpus as long as the stigma; the radius perpendicular to the anterior margin of the wing, and about as long as the transverse cubitus; abdomen rather slender, strongly compressed; first tergite narrowing gradually from base to apex, where it is a little broader than the second tergite is long down the middle, smooth at base, ruguloso-striate on the posterior two-thirds; second tergite small, as broad at base as first tergite is broad at apex, and much broader at apex than at base, defined laterally by oblique grooves, and entirely rugulose; the membranous margins on the two basal abdominal tergites very broad; the third and following tergites smooth and very shining; hypopygium not projecting beyond the apex of the last dorsal segment; ovipositor sheaths more than one-third the length of the abdomen, and narrowing gradually toward tip. Mostly black; antennal scape yellowish; remainder of the antennae dark brown or black; tegulae pale yellow; wings slightly clouded, the veins and stigma brown; legs entirely, including all coxae, testaceous; membranous margins along the two basal abdominal tergites pale yellowish except for a brownish spot at either side of the second tergite; sides of the abdomen beneath yellow except at apex; keel blackish; ovipositor sheaths brownish-black.

Male.—Essentially as in the female.

Cocoons.—White; gregarious, and arranged parallel in a compact mass, but not inclosed in a ball of loose silk.

Type locality.—Rye, New York.

Type.—Cat. No. 22525, U.S.N.M.

Hosts.—*Papaipema maritima* Bird; *P. nebris* Guenée.

Described from many specimens of both sexes bred by Henry C. Bird.

67. APANTELES LUTEIPENNIS, new species.

Female.—Length, 2 mm. Face indistinctly punctate and opaque; vertex somewhat shining, weakly punctate; mesoscutum evenly punctate, the scutellar disk distinctly but more sparsely so; lateral aspect of scutellum with the posterior polished area distinctly smaller than the sculptured portion in front; both mesoscutum and scutellum opaque; propodeum dull, rugulose, with a distinct median longitudinal carina; forewing with the radius slightly longer than the transverse cubitus and tending somewhat toward base of wing; nervellus oblique but not strongly curved; posterior coxae smooth and shining; spurs of posterior tibiae short, much less than half the length of the metatarsus, the inner but very slightly longer than the outer; abdomen slender, somewhat compressed; the first tergite very narrow, much narrower at apex than at base, and at least twice as long as broad at base, the posterior half rugulose and dull; second tergite triangular, very narrow at base, and about as broad at apex as long down the middle, slightly roughened and opaque; remainder of the abdomen smooth and shining; hypopygium not extending beyond the apex of the last dorsal segment; ovipositor subexserted. Black; antennae entirely yellowish; tegulae testaceous; wings slightly luteous, the stigma and veins light brown; legs entirely pale testaceous, except most of the hind coxae, which are dark brown; membranous margins along the two basal abdominal tergites very pale yellowish; dorsal abdominal segments beyond the second castaneous.

Cocoons.—Small, white; gregarious, grouped together but not embedded.

Type locality.—Virginia.

Type.—Cat. No. 22526, U.S.N.M.

Host.—(?) *Argynnis*, species.

Described from five female specimens bred under Bureau of Entomology No. 3188, August 4, 1883.

68. APANTELES LONGICORNIS (Provancher).

Microgaster longicornis PROVANCHER, Addit. faun. Canad. Hymenop., 1886, pp. 139, 143.

Apanteles longicornis PROVANCHER, Addit. faun. Canad. Hymenop., 1888, p. 388.

Habitat.—Canada.

Host.—Unknown.

Type in the Museum of Public Instruction at Quebec, Canada, and not examined. The species has been placed in the table on the basis of the original description and notes made by A. B. Gahan after a study of the type. It appears to be very similar to *radiatus*, but is probably distinct, apparently having clear hyaline wings.

69. APANTELES RADIATUS Ashmead.

Apanteles radiatus ASHMEAD, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 162.

Habitat.—New Hampshire; Illinois; Virginia; New York.

Host.—Unknown. The type series was recorded from "a lepidopterous larva feeding on *Plantago major*."

The National Collection contains, in addition to the type series, two specimens of this species from Illinois, and one from Arlington, Virginia, without further data.

70. APANTELES FLAVOVARIATUS, new species.

Very similar to *papaipemae*, from which it differs in lacking the prominent median longitudinal carina on the propodeum, and in the second abdominal tergite being only half as broad at base as long down the middle.

Female.—Length, 3.3 mm. Face hardly broader than long, shining; vertex, temples, and cheeks smooth and shining; mesoscutum very weakly punctate and shining; scutellar disk indistinctly punctate; the sloping lateral face of scutellum with the posterior polished area much smaller than the sculptured area in front; mesopleura highly polished, with a short oval longitudinal depression posteriorly; propodeum very weakly punctate, without areola or costulae, shining; radius of forewing about as long as the transverse cubitus, and uniting with it in a strong angle; nervellus curving rather strongly behind toward base of wing; posterior coxae large, smooth, and shining; inner spur of posterior tibiae a little longer than the outer, and slightly longer than half the metatarsus; abdomen exceedingly strongly compressed; first tergite narrowing toward apex, and more than twice as long as broad at base, weakly punctate on apical half; second tergite triangular, defined laterally by sharp furrows, about half as broad at base as long down the middle, and as broad at apex as long down the middle, and very weakly striate at the sides; membranous margins along the two basal abdominal tergites very broad; third and following dorsal segments smooth and shining; hypopygium somewhat projecting; ovipositor sheaths distinctly exserted but short. Black; antennal scape somewhat yellowish below; tegulae and wing-bases testaceous; stigma and veins brown; legs wholly testaceous, except the extreme base of posterior coxae; lateral membranous margins on the two basal abdominal tergites pale flavous; third abdominal tergite brownish-testaceous; sides and venter of abdomen flavous except at apex.

Male.—Like the female in all essential characters.

Cocoons.—Glossy white, with very little loose silk; probably gregarious.

Type locality.—Michigan.

Type.—Cat. No. 22527, U.S.N.M.

Described from seven female and two male specimens from the Ashmead collection. Two of the paratype specimens are labeled as having been collected on Mount Angel, in Oregon.

71. APANTELES NEOMEXICANUS, new species.

Female.—Length, 3.5 mm. Face slightly broader than long, weakly punctate, and opaque; vertex rather closely punctate; mesoscutum very minutely evenly punctate and shining; scutellar disk slightly convex, with a few scattered indistinct punctures; the lateral face of scutellum with the sculptured area much larger than the posterior polished portion; propodeum closely punctate, opaque; anterior wing with the metacarpus distinctly longer than the stigma, and the radius about as long as the transverse cubitus; nervellus curving strongly behind toward base of wing; posterior coxae large, finely punctate and shining; spurs of posterior tibiae about equal in length and almost half as long as the metatarsus; abdomen slender, somewhat compressed; the first tergite narrower at apex than at base, and at least twice as long as broad at base, punctate and shining; second tergite subtriangular, defined laterally by sharp oblique grooves, about as broad at base as long, and at least one and one-half times as broad at apex as long down the middle, the apical margin arcuate, the tergite mostly smooth and shining; third and following dorsal segments smooth and shining; hypopygium rather stout, not extending beyond apex of the last dorsal abdominal segment; ovipositor very strongly curved, sicklelike, the sheaths broad and about two-thirds the length of the abdomen. Black; antennae wholly black; tegulae testaceous; wings very faintly clouded, the stigma and veins brown; legs reddish-testaceous, except the posterior coxae, which are black or blackish, and the posterior tarsi, which are slightly dusky; ovipositor sheaths black; sides of abdomen beneath largely yellowish; the broad lateral membranous margins on the two basal abdominal tergites pale.

Cocoons.—White; with no loose silk; apparently solitary.

Type locality.—Santa Fe, New Mexico.

Type.—Cat. No. 22528, U.S.N.M.

Described from five female specimens collected by T. D. A. Cockerell, August 14, 1895. Ashmead's manuscript name has been adopted.

72. APANTELES SARROTHRIPAE Weed.

Apanteles sarrothripae WEED, Bull. Ill. State Lab. Nat. Hist., vol. 3, 1897, p. 3.

Habitat.—Illinois; Massachusetts; Michigan.

Hosts.—*Sarrothripa revayana* Scopoli; *Ichthyura inclusa*, Hübner; *Peronea permutana* Duponchel.

Cocoons.—Whitish; gregarious but not embedded in silk.

In addition to two cotypes of this species the National Collection contains a large series of specimens bearing Bureau of Entomology No. 3981°, recorded as parasitic on *Sarrothripa revayana;* four specimens without locality label, but which are said to have been reared from *Peronea permutana;* and one specimen from Agricultural College, Michigan, bearing Accession No. 743^a and said to have been reared from a locust leaf-miner. The writer has also seen a large series in the collection of the Gipsy Moth Laboratory, Melrose Highlands, Massachusetts. These specimens were bred from *Ichthyura inclusa* at Lynnfield, Massachusetts.

73. APANTELES ALTICOLA (Ashmead).

Protapanteles alticola ASHMEAD, Proc. Wash. Acad. Sciences, vol. 4, 1902, p. 248.

Habitat.—Alaska; Utah.

Host.—*Chorizagrotis*, species.

The National Collection contains, besides the type series, a single specimen of this species from Nephi, Utah, reared by C. N. Ainslie from *Chorizagrotis*, species, under Webster No. 6662.

74. APANTELES ETIELLAE (Viereck).

Apanteles (*Pseudapanteles*) *etiellae* VIERECK, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 178.

Apanteles iselyi, CUSHMAN, Proc. Ent. Soc. Wash., vol. 21, 1919, p. 120.

Habitat.—Washington; Arkansas; Iowa.

Hosts.—*Etiella schisticolor* Zeller (Viereck); (*Canarsia*) *Psorosina hammondi* Riley (Cushman).

After a careful study of the types of these two species the writer is convinced that they can not be held distinct.

The following specimens are contained in the United States National Museum collection in addition to the types: One specimen from Bentonville, Arkansas, reared under Quaintance No. 16356 from *Canarsia*, species, and two specimens from Shenandoah, Iowa, reared by R. L. Webster under Experiment No. 333, from *Psorosina hammondi.*

75. APANTELES CASSIANUS Riley.

Apanteles cassianus, RILEY, Trans. Acad. Sci. St. Louis, vol. 4, pt. 2, 1881, p. 387; in Scudder, Butterflies U. S., 1889, p. 1909.

Habitat.—Illinois; Colorado; Iowa.

Hosts.—*Eurema nicippe* Cramer (Riley); *Eurymus eurytheme* Boisduval (Riley).

Besides the type series, the National Collection contains one specimen of this species collected by S. H. Scudder at Bruce, Colorado; one specimen from Ames, Iowa, collector unknown, but bearing Experiment Station Catalogue No. 801; also several additional specimens without definite data.

76. APANTELES VICTORIAE, new species.

Female.—Length, 3 mm. Head shining, weakly punctate; antennae not quite as long as the body; mesoscutum opaque, with numerous minute punctures, rather smooth posteriorly; disk of scutellum flat, indistinctly punctate, shining; mesopleura almost entirely smooth and shining; propodeum almost impunctate and without a trace of a median carina, smooth and shining; forewing with the metacarpus distinctly longer than the stigma; the radius a little longer than the transverse cubitus; spurs of the posterior tibiae about equal in length and distinctly shorter than half the metatarsus; abdomen long, slender, somewhat compressed; the first tergite narrowing gradually from base to apex, where it is about as broad as the second tergite is long down the middle, punctate except on the basal half, where it is smooth and polished; second tergite a little broader at base than long down the middle, defined laterally by sharp oblique grooves, about twice as broad at apex as at base, and punctate; lateral membranous margins on the two basal abdominal tergites very broad; third and following dorsal abdominal segments smooth and shining; ovipositor sheaths almost as long as the abdomen, broadening to near the tip and then narrowing again. Black; antennae wholly black; tegulae black; wings decidedly infumated; legs black, except the apex of the fore femora and most of the fore tibiae, and the extreme base of the middle and posterior tibiae, which are yellowish; abdomen entirely black above and below; ovipositor sheaths black.

Type locality.—Victoria, Vancouver.

Type.—Cat. No. 22529, U.S.N.M.

Described from one female specimen from the Ashmead collection. Ashmead's manuscript name has been used.

77. APANTELES MONTICOLA Ashmead.

Apanteles monticola ASHMEAD, Bull. Colorado Biol. Assoc., vol. 1, 1890, p. 17.

Habitat.—Colorado.

Host.—Unknown.

Known only from the unique type in the United States National Museum.

78. APANTELES GLACIALIS (Ashmead).

Protapanteles glacialis ASHMEAD, Proc. Wash. Acad. Sciences, vol. 4, 1902, p. 248.

Habitat.—Alaska.

Host.—Unknown.

Very similar to *ornigis* Weed, but probably distinct, as shown in the key.

Known only from the type specimen in the United States National Museum.

79. APANTELES FELTIAE (Viereck).

Apanteles (Protapanteles) feltiae VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 625.

Habitat.—Indiana.

Host.—*Feltia*, species.

Known only from the unique type in the United States National Museum.

80. APANTELES NIGER, new species.

Very similar to *victoriae;* but differs from that species in the hyaline wings, in the shorter ovipositor sheaths, in the disk of scutellum being less smooth, and in the metacarpus being distinctly shorter than the stigma.

Female.—Length, 2.7 mm. Face closely finely punctate, somewhat shining; clypeus indistinctly separated from face; vertex, temples, and cheeks finely punctate and shining; mesoscutum long, at least as long as broad very closely finely punctate and opaque; scutellar disk slightly longer than broad at base, almost flat, with numerous well-defined punctures; the suture at the base of scutellum very narrow, so that the numerous pits within are scarcely distinguishable; lateral face of the scutellum with the sculptured portion distinctly larger than the semicircular polished area behind; mesopleura mostly polished, with a shallow longitudinal depression posteriorly; propodeum mostly smooth and shining, with scattered punctures; metacarpus shorter than the stigma, the radius about equal in length to the transverse cubitus; posterior coxae mostly smooth and shining; spurs of posterior tibiae equal in length and half as long as the metatarsus; abdomen compressed on the apical half; first tergite distinctly narrower at apex than at base, and hardly twice as long as broad at base, punctate posteriorly, and with a shallow, median longitudinal depression on the apical third; second tergite short and transverse, at least three times as broad at apex as long down the middle, longer medially than at the sides, the posterior margin being arcuate, the plate more or less punctate; remainder of the abdomen smooth and shining; hypopygium projecting somewhat beyond the apex of the last dorsal segment; ovipositor sheaths broad, two-thirds the length of the abdomen. Entirely black, including the antennae, the tegulae, all legs entirely, and the abdomen above and below; wings hyaline, stigma and veins brown.

Male.—Differs from the female only in the narrower abdomen, and in the second abdominal tergite being smoother and not so short and broad.

Type locality.—Onaga, Kansas.

Allotype locality.—Brookings, South Dakota.

Type.—Cat. No. 22530, U.S.N.M.

Described from one female and two male specimens received from the Ashmead collection.

81. APANTELES SCUTELLARIS, new species.

Female.—Length, 2.6 mm. Face short and broad, very minutely and closely punctate and shining; vertex and temples indistinctly punctate; antennae very short, distinctly shorter than the body; mesoscutum uniformly very shallowly punctate; scutellar disk large, broad at base, rather flat, and covered with minute shallow punctures; lateral face of scutellum with the anterior sculptured portion larger than the polished area behind; mesopleura very weakly minutely punctate on the anterior half, polished behind, and with a broad, very shallow, shining longitudinal depression; propodeum punctate, slightly rugulose medially, with a suggestion of a median longitudinal carina; metacarpus hardly as long as stigma; radius very slightly longer than transverse cubitus, and uniting with the latter in a rather sharp angle; nervellus oblique but not strongly curved; posterior coxae smooth and very shining; spurs of posterior tibiae equal in length and almost half as long as the metatarsus; abdomen rather broad; first tergite much narrower at apex than at base, hardly twice as long as broad at base, smooth and shining on basal half, punctate and opaque on apical half; second tergite short and transverse, much narrower at extreme base than at apex, about four times as broad at apex as long down the middle, and much longer medially than at the sides, the posterior margin being arcuate, the plate at least somewhat rugulose on the apical half; lateral membranous margins along the two basal abdominal tergites very broad; third and following tergites smooth and shining; hypopygium slightly projecting; ovipositor sheaths two-thirds the length of the abdomen. Black; antennae wholly black; tegulae black; wings hyaline, stigma and veins yellowish-brown; legs black, except the apex of the fore and middle femora and all the tibiae mostly, which are yellowish; venter of the abdomen entirely black; ovipositor sheaths black.

Male.—Differs only in having the antennae long than the body, and the second abdominal tergite relatively longer and narrower and more smooth and shining.

Type locality.—Pasadena, California.

Type.—Cat. No. 22531, U.S.N.M.

Host.—*Phthorimaea operculella* Zeller.

Four female and three male specimens bred by J. E. Graf in the Bureau of Entomology, and recorded under Chittenden No. 2230 ^{07}.

82. APANTELES THORACICUS, new name.

Pseudapanteles sancti-vincenti Ashmead, Trans. Ent. Soc. London, 1900, pt. 2, p. 291 (not *Apanteles sancti-vincenti* Ashmead, Trans. Ent. Soc. London, 1900, pt. 2, p. 279).

Habitat.—St. Vincent.

Host.—Unknown.

Represented in the National Collection by a single cotype; other cotypes are in the British Museum.

83. APANTELES STAGMATOPHORAE Gahan.

Apanteles stagmatophorae Gahan, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 120.

Habitat.—Maryland.

Host.—*Stagmatophora gleditschiaeella* Chambers (Gahan).

Known only from the type series in the United States National Museum.

84. APANTELES COMPRESSUS Muesebeck.

Apanteles compressus Muesebeck, Can. Ent., vol. 51, 1919, p. 114.

Habitat.—Massachusetts; New Hampshire; Rhode Island.

Host.—*Hypoprepia*, species (Muesebeck).

Cocoons.—White; gregarious, closely fastened together.

The type and four paratypes of this species are in the United States National Museum; the remaining paratypes are in the collection of the Gipsy Moth Laboratory, Melrose Highlands, Massachusetts.

85. APANTELES COMPRESSIVENTRIS, new species.

Female.—Length, 2.6 mm. Face impunctate and strongly shining, a strong median ridge arising just below the insertion of the antennae, and extending halfway to the clypeus; clypeus conspicuously separated from the face; temples broad; vertex, temples, and cheeks, impunctate, very shining; mesoscutum weakly punctate and shining; disk of scutellum slightly convex, impunctate and polished; mesopleura polished; propodeum very feebly punctate and strongly shining, without an areola or any carinae; metacarpus about as long as the stigma, or only indistinctly longer; radius of forewing about equal in length to the transverse cubitus and making a strong angle with the latter; nervellus behind curving toward base of wing; posterior coxae indistinctly punctate and shining; inner spur of posterior tibiae distinctly longer than the outer, but hardly half the length of the metatarsus; entire abdomen exceedingly strongly compressed; first tergite very slender, narrowing gradually toward apex, where it is much narrower than at base, distinctly more than twice as long as broad at base, rather ruguloso-punctate laterally; second tergite small, defined laterally by oblique grooves that diverge posteriorly, less than half as broad at base as long down the middle, and slightly broader at apex than long down the middle, smooth and polished medially; lateral membranous margins along the two basal abdominal tergites broad; third and following tergites smooth and shining; hypopygium extending a little beyond the apex of the last dorsal segment; ovipositor very slightly projecting. Black; antennae wholly black; tegulae and wing-bases dark brown; wings feebly yellowish-hyaline, stigma and veins brown; all coxae black; posterior trochanters brown; remainder of the legs dark reddish-testaceous, except the apex of the posterior tibiae and the posterior tarsi, which are fuscous; venter of the abdomen black; lateral membranous margins along the two basal abdominal tergites testaceous.

Male.—As in the female, except that the legs are somewhat more dusky, the posterior femora being edged with blackish.

Type locality.—Mount Washington, New Hampshire.

Type.—Cat. No. 22532, U.S.N.M.

Host.—"Arctiid."

Described from many specimens of both sexes.

86. APANTELES PHIGALIAE Muesebeck.

Apanteles phigaliae MUESEBECK, Can. Ent., vol. 51, 1919, p. 113.

Habitat.—Massachusetts.

Host.—*Phigalia titea* Cramer (Muesebeck).

Cocoons.—Light brown; the surface uneven, being furrowed longitudinally; gregarious, but with no loose silk.

Known only from the type series, of which the type and four paratypes are in the United States National Mueseum, and the remaining paratypes in the collection of the Gipsy Moth Laboratory at Melrose Highlands, Massachusetts.

87. APANTELES ALASKENSIS (Ashmead).

Protapanteles alaskensis ASHMEAD, Proc. Wash. Acad. Sciences, vol. 4, 1902, p. 247.

Habitat.—Alaska.

Host.—Unknown.

Known only from the types in the National collection.

88. APANTELES POLITUS Riley.

Apanteles politus RILEY, Trans. Acad. Sci. St. Louis, vol. 4, pt. 2, 1881, p. 307.

Habitat.—Missouri; Illinois.

Host.—*Scolecocampa liburna* Geyer (Riley).

Cocoons.—Dirty whitish; gregarious, in irregular masses.

Represented in the National collection by a large type series, and also by four specimens collected at Champaign, Illinois; collector not indicated.

89. APANTELES MILITARIS (Walsh).

Microgaster militaris WALSH, Insect, Injur. Vegt. Illinois, 1861, p. 27; Riley, 2d Rep. Insects Missouri, 1870, p. 52.

Microgaster (*Apanteles*) *militaris* Walsh, RILEY, 3d Rep. U. S. Ent. Commiss., 1883, pp. 126–127.

Habitat.—Illinois; Missouri; New York; Massachusetts; Tennessee; Virginia; Oklahoma; Connecticut; New Jersey. Apparently widely distributed over the entire United States.

Hosts.—*Cirphis unipuncta* Haworth; *C. phragmatidicola* Guenée; *Laphygma frugiperda* Smith and Abbot; *Heliothis obsoleto* Fabricius; *Chorizagrotis*, species.

Cocoons.—Color buff to dirty whitish; gregarious, but not imbedded.

In addition to the large type series, the National Collection contains numerous series of this well-known species reared from the Army worm, *Cirphis unipuncta*, in widely distributed localities; also a series said to have been reared from *Laphygma frugiperda* at Nashville, Tennessee, by G. G. Ainslie, under Webster No. 9820; a series reared by R. C. Smith at Charlottesville, Virginia, under Webster No. 9380, supposedly from *Heliothis obsoleta;* a series from Shawnee, Oklahoma reared by W. E. Pennington from *Chorizagrotis*, species under Webster No. 12756, and a series reared under Bureau of Entomology No. 2548, from *Cirphis phragmatidicola.*

90. APANTELES FLORIDANUS, new species.

Resembles *militaris* very closely, differing only in having black posterior coxae; this character, however, is apparently constant.

Female.—Length, 2.3 mm. Face somewhat broader than long, weakly punctate and very shining; vertex and temples indistinctly punctate and shining; mesoscutum closely punctate anteriorly, weakly so posteriorly; disk of scutellum rather flat, sparsely punctate, somewhat opaque; mesopleura punctate and dull anteriorly, smooth and polished on posterior half, and with a conspicuous, deep, longitudinal depression below; propodeum dull, punctate at base, very finely rugulose behind, without an areola, and with a faint suggestion of a median longitudinal carina posteriorly; forewing with the stigma broad, and the radius slightly longer than the transverse cubitus; nervellus oblique but not distinctly curved; posterior coxae largely smooth and polished, with a distinct oval, flattened area on the outer face above at base; inner spur of posterior tibiae longer than the outer, and almost half the length of the metatarsus; abdomen with the first tergite very slender, narrowing steadily from base to apex, so that it is much narrower at apex than at base, at least twice as long as broad at base, entirely smooth and very highly polished; second tergite triangular, defined laterally by sharp oblique grooves that diverge posteriorly, about twice as long as broad at base, and about twice as broad at apex as long down the middle, perfectly smooth and highly polished like the remainder of the abdomen; lateral membranous margins of the two basal abdominal tergites very broad; hypopygium not extending beyond the apex of the abdomen; ovipositor not exserted. Black; tegulae pale brown; wings hyaline, stigma and veins brown; fore and middle coxae yellow; posterior coxae dark brown above and deep black beneath; remainder of the legs stramineous, except that apex of posterior femora and of posterior tibiae are somewhat dusky; lateral membranous margins along the two basal abdominal tergites bright testaceous; abdominal tergites with a faint castaneous tinge; sides of the venter at the base testaceous.

Male.—Essentially as in the female.

Cocoons.—Buff in color, gregarious, and loosely heaped together, as in *militaris.*

Type locality.—Archer, Florida.

Type.—Cat. No. 22533, U.S.N.M.

Host.—"Noctuid."

Described from many specimens of both sexes bred from cocoons. Ashmead's manuscript name has been used.

91. APANTELES SORDIDUS Ashmead.

Apanteles sordidus Ashmead, Trans. Ent. Soc. London, 1900, pt. 2, p. 279.

Habitat.—St. Vincent.

Host.—Unknown.

The type of this species is in the British Museum, and has not been seen by the writer. The species has been placed in the key on the basis of the original description.

92. APANTELES NIGRICORNIS, new species.

Female.—Length, 2.4 mm. Face somewhat punctate, shining, with a distinct median longitudinal ridge just below the insertion of the antennae; antennae much longer than the body; vertex, temples, and cheeks weakly punctate and shining; mesoscutum shining, shallowly punctate, the punctures becoming less distinct posteriorly; disk of scutellum somewhat convex, indistinctly punctate, rather shining; mesopleura mostly smooth and polished, with a conspicuous, non-crenulate, longitudinal depression posteriorly; propodeum without an areola, punctate, with slight rugulosity posteriorly in the middle, dull, except the apical lateral areas, which are shining; radius at least no longer than transverse cubitus; nervellus slightly curved behind toward base of wing; posterior coxae mostly smooth and polished, without the flattened area at base common to many species; inner spur of posterior tibiae longer than the outer and half the length of the metatarsus; abdomen rather slender; first tergite very narrow, much narrower at apex than at base, more than twice as long as broad at base, and mostly smooth and polished, there being only a few weak punctures laterally near the apex; second tergite small, triangular, defined laterally by sharp oblique grooves, very narrow at extreme base, and hardly as broad at apex as long down the middle, smooth and polished like the remainder of the abdomen; lateral membranous margins along the apical half of the first tergite and the entire length of the second very broad; ovipositor hardly exserted. Black; antennae entirely black; tegulae blackish; wings hyaline, the stigma and veins brown; legs testaceous, except all coxae, which are black, and the extreme apex of the posterior femora and of posterior tibiae, and practically all of the posterior tarsi, which are slightly dusky; lateral membranous margins along the two basal abdominal tergites rather fusco-testaceous; third tergite with a more or less distinct testaceous spot on either side.

Male.—Essentially as in the female, except that the first abdominal tergite is not at all punctate at the sides and the third tergite is entirely black.

Cocoons.—Very dark brownish gray, covered with pale gray silk; gregarious but not embedded in silk.

Type locality.—Ventura, California.

Type.—Cat. No. 22534, U.S.N.M.

Host.—*Ctenucha brunnea* Stretch, on authority of E. O. Essig.

Described from two females and one male bred from cocoons by S. H. Essig.

93. APANTELES WEBSTERI, new species.

Female.—Length, 2.3 mm. Face hardly broader than long, weakly punctate, somewhat shining, and with a more or less distinct median ridge; vertex with shallow punctures, opaque; mesoscutum punctate, indistinctly so posteriorly, dull; disk of scutellum somewhat convex, indistinctly punctate and shining; mesopleura largely smooth and very shining, the longitudinal depression having within it numerous very fine, transverse, curved striulae; propodeum smooth and shining, with only a few scattered, indistinct punctures, and without an areola; radius longer than transverse cubitus; nervellus not distinctly curved; posterior coxae smooth and polished, with a conspicuous flattened area at base above; inner spur of posterior tibiae distinctly longer than the outer and slightly more than half the length of the metatarsus; abdomen slender; first tergite very narrow, much narrower at apex than at base, more than twice as long as broad at base, entirely smooth, and highly polished; second tergite small, triangular, defined laterally by sharp, oblique grooves, very narrow at extreme base, and about as broad at apex as long down the middle, perfectly smooth, and very highly polished; lateral membranous margins along the apical half of the first tergite and the entire length of the second broad; third and following tergites very smooth and shining; ovipositor subexserted. Black; antennae rather brownish; wings hyaline, the stigma and veins brown; legs testaceous, except the brownish fore and middle coxae, the black hind coxae, the dusky apex of posterior femora and of posterior tibiae, and the slightly dusky posterior tarsi; sides of the venter of the abdomen yellowish on basal half.

Male.—Essentially as in the female.

Cocoons.—Dark brown in color; gregarious and cemented together side by side, with no loose silk.

Type locality.—(?) Ohio.

Type.—Cat. No. 22535, U.S.N.M.

Host.—"Geometrid."

Described from three female and five male specimens bred by Prof. F. M. Webster February 1, 1885.

94. APANTELES CAFFREYI, new species.

Very close to *nigricornis;* the striking cocoons of the two species are almost identical. The adult differs in the shorter antennae, in the pale tegulae, in the radius being longer than transverse cubitus, and in the first abdominal tergite not narrowing gradually from base to apex.

Female.—Length, 2.2 mm. Face slightly broader than long, weakly punctate; vertex, temples, and cheeks punctate and opaque; mesoscutum punctate, more weakly so posteriorly; disk of scutellum slightly convex, about as broad at base as long, indistinctly punctate, and not strongly shining; mesopleura punctate anteriorly, polished behind; propodeum weakly punctate, with a few radiating striulae arising at the middle of the posterior margin, and extending forward; propodeal areola wanting; metacarpus distinctly longer than the stigma and the radius longer than the transverse cubitus; nervellus slightly curved behind toward base of wing; posterior coxae smooth and polished, with a narrow flattened area on outer upper edge at base; inner spur of posterior tibiae slightly longer than the outer and at least half as long as the metatarsus; abdomen slender; first tergite very narrow and much narrower at apex than at base, two and one-half times as long as broad at base, and perfectly smooth and polished; second tergite triangular, defined laterally by sharp oblique grooves, less than half as broad at base as long, and about as broad at apex as long; the second tergite, like the remainder of the abdomen, entirely smooth and polished; lateral membranous margins along the apical third of the first tergite and the entire length of the second, very broad; ovipositor subexserted. Black; antennae black, except the scape, which is reddish beneath; tegulae and wing bases pale testaceous; wings hyaline, the stigma and veins pale brown; legs yellowish, except all coxae, which are black, and the apex of the posterior femora and of posterior tibiae, and most of the posterior tarsi, which are dusky; the lateral membranous margins on the two basal abdominal tergites pale testaceous, this color extending along the sides of the third tergite as well.

Male.—Differs from the female only in the usual sexual characters.

Cocoons.—Dark brownish-gray, covered with threads of pale gray silk; gregarious and cemented together, but not embedded in silk.

Type locality.—Tempe, Arizona.

Type.—Cat. No. 22536, U.S.N.M.

Described from two female and one male specimens bred by D. J. Caffrey from collected cocoons.

95. APANTELES HERBERTII Ashmead.

Apanteles herbertii ASHMEAD, Trans. Ent. Soc. London, 1900, pt. 2, p. 279.

Habitat.—St. Vincent; Grenada.

Host.—Unknown.

The only specimens of this species that have been seen by the writer are two cotypes in the National Collection. Other cotypes are in the British Museum.

96. APANTELES GILLETTEI Baker.

Apanteles gillettei BAKER, Ent. News, vol. 6, 1895, p. 202.

Habitat.—Colorado.

Host.—Cacoecia argyrospila Walker (Baker).

Known only from the type series in the United States National Museum.

97. APANTELES PARASTICHTIDIS, new species.

Female.—Length, 2.8 mm. Face broad, weakly punctate, and shining; antennae shorter than the body, the five or six apical segments broader than long; vertex and temples broad, weakly punctate, and shining; mesoscutum very shallowly punctate, strongly shining; scutellum with the disk slightly convex, with only a few scattered indistinct punctures, and very shining, and the lateral face with the posterior polished area small and semicircular in shape; mesopleura very highly polished; propodeum smooth and shining at extreme base, uniformly rugulose behind, and with a distinct median longitudinal carina, the areola wanting; stigma large; the radius longer than the transverse cubitus, with which it makes a sharp angle; nervellus curving somewhat toward base of wing; posterior coxae slightly granular but shining; inner spur of posterior tibiae slightly longer than the outer and half as long as the metatarsus; abdomen very long and slender, distinctly longer than the thorax, and about five times as long as broad in the widest part; first tergite somewhat broader at apex than at base, entirely finely ruguloso-striate; second tergite subtrapezoidal, also uniformly finely ruguloso-striate and opaque; remainder of the abdomen perfectly smooth and very highly polished; abdomen strongly compressed on the apical half; ovipositor very slightly exserted. Black; antennae brown; tegulae blackish; wings hyaline, with the stigma and veins dark brown; legs entirely testaceous, except all coxae, which are black.

Cocoons.—White and thin; gregarious, but not embedded in a mass of silk.

Type locality.—Parksville, Tennessee.

Type.—Cat. No. 22537, U.S.N.M.

Host.—Parastichtis bicolorago Guenée.

Described from six female specimens in the United States National Museum.

98. APANTELES PHOLISORAE Riley.

Apanteles pholisorae RILEY, in Scudder, Butterflies U. S., 1889, p. 1904.

Habitat.—Illinois; Missouri; South Carolina.

Host.—*Pholisora catullus* Fabricius (Riley).

Cocoons.—White; gregarious, but not embedded in silk.

In addition to the type series the National Collection contains specimens of this species from Champaign, Illinois, reared from *Pholisora catullus;* specimens reared by Miss Mary E. Murtfeldt at Kirkwood, Missouri, from the same host; and one specimen from Batesburg, South Carolina, collected by E. S. G. Titus.

99. APANTELES JUNONIAE Riley.

Apanteles junoniae RILEY, in Scudder, Butterflies U. S., 1889, p. 1904.

Habitat.—United States.

Host.—*Junonia coenia* Hübner (Riley).

The type specimen, in the United States National Museum, is not in good condition, and apparently not a normal specimen. It is the only known representative of the species; and while it seems to be distinct, further study may indicate that it is not.

100. APANTELES LUNATUS (Packard).

Microgaster (*Apanteles*) *lunatus* PACKARD, Proc. Boston Soc. Nat. Hist., vol. 21, 1881, p. 28.

Apanteles lunatus Packard, WEED, Trans. Amer. Ent. Soc., vol. 15, 1888, p. 295.—RILEY, in Scudder, Butterflies U. S., 1889, p. 1903.

Habitat.—Massachusetts; Iowa; Illinois; New York; Connecticut; California; Washington.

Hosts.—*Papilio polyxenes* Fabricius (Riley); *P. zolicaon* Boisduval; *P. oregonia* Edwards.

Cocoons.—Yellowish, often angular; solitary.

Besides the type series there are in the National Collection four specimens from California—Ricksecker, collector—reared from *Papilio zolicaon*, and three specimens from Wenatchee, Washington, reared by E. J. Newcomer from *Papilio oregonia* under Quaintance No. 11485. The writer has also seen specimens of this species in the collections of the Iowa and Illinois Agricultural Experiment Stations and of Cornell University.

101. APANTELES LIMENITIDIS (Riley).

Microgaster limenitidis RILEY, 3d Ann. Rep. Insects Missouri, 1871, p. 158.

Apanteles limenitidis Riley, PACKARD, Proc. Boston Nat. Hist. Soc., vol. 21, 1881, p. 28; Riley, in Scudder, Butterflies U. S., 1889, p. 1902.

Habitat.—Connecticut; Missouri; Massachusetts

Host.—*Basilarchia archippus* Cramer.

Cocoons.—Pale yellow; solitary.

Represented in the National Collection by the type series only; it has, however, been recorded from the above-named host in Connecticut, and the writer has seen a specimen, reared from the same host in Massachusetts, in the collection of the Gipsy Moth Laboratory at Melrose Highlands, Massachusetts.

102. APANTELES AGRICOLA (Viereck).

Apanteles (Protapanteles) agricola VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, pp. 186, 192.

Habitat.—Connecticut.

Host.—Unknown.

Known only from the unique type, which is in the collection of the Connecticut Agricultural Experiment Station.

The species is very similar to *nemoriae*, from which it appears to differ only in being not so deep black; it may ultimately prove to be that species.

103. APANTELES NEMORIAE Ashmead.

Apanteles nemoriae ASHMEAD, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 160.—DIMMOCK, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 152.

Apanteles (Protapanteles) winkleyi VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, pp. 186 and 192.

Habitat.—New Hampshire; Connecticut; Tennessee; District of Columbia.

Hosts.—(*Nemoria*) *Haematopis grataria* Fabricius; *Eupithecia miserulata* Grote; *Pleuroprucha insulsaria* Guenée; *Chlorochlamys chloroleucaria* Guenée (Dimmock).

Cocoons.—Yellowish-white; solitary.

Represented in the United States National Museum by the Ashmead and Viereck types; also by one specimen from Washington, District of Columbia, C. L. Marlatt, collector, host not given; and by a large series of specimens from Knoxville, Tennessee, reared from *Pleuroprucha insulsaria* Guenée by W. B. Cartwright, of the Bureau of Entomology.

A careful study of the type material has convinced the writer that *winkleyi* Viereck is identical with *nemoriae* Ashmead.

104. APANTELES RUFOCOXALIS Riley.

Apanteles congregatus, var. *rufocoxalis* Riley, Trans. Acad. Sci. St. Louis, vol. 4, pt. 2, 1881, p. 310.

Apanteles rufocoxalis Riley, Quaintance, U. S. Dept. Agr., Bur. Ent. Circ. 98, 1908, p. 5.

Apanteles (Protapanteles) rufocoxalis Riley, Viereck, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, pp. 187 and 194.

Habitat.—Missouri; Tennessee; Texas; Virginia; New York; Nova Scotia.

Hosts.—*Cirphis unipuncta* Haworth (Riley); *Nephelodes emmedonia* form *violans* Guenée; (?) *Malacosoma americana* Fitch (Quaintance).

Cocoons.—Gregarious, completely embedded in a fluffy ball of pale buff silk.

This species is widely different from *congregatus*, and certainly can not be considered a variety of that species.

In addition to the type series the National Collection contains the following material: Five specimens from Nashville, Tennessee, reared by G. G. Ainslie, under Nashville No. 15205; 6 specimens from Truro, Nova Scotia, collected August 30, 1914, without further data; 4 specimens from Brownsville, Texas, reared by R. A. Vickery, under Webster Nos. 6451 and 6453; 21 specimens from central Missouri, without further data; 2 specimens from Falls Church, Virginia, collected by Nathan Banks; 1 specimen from Batavia, New York, reared by H. H. Knight from the army worm.

105. APANTELES SCITULUS Riley.

Apanteles congregatus, var. *scitulus* Riley, Trans. Acad. Sci. St. Louis, vol. 4, pt. 2, 1881, p. 310.

Apanteles emarginatus Riley, in Scudder Butterflies of U. S., 1889, p. 1906.

Apanteles (Protapanteles) scitulus Riley, Viereck, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, p. 193.

Apanteles parorgyiae Ashmead, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 161.

Apanteles (Cryptapanteles) rileyanus Viereck=(*A. emarginatus* Riley preoccupied), Proc. Ent. Soc. Wash., vol. 11, 1910, p. 210.

Habitat.—Missouri; New Hampshire; Nebraska; Maryland; Tennessee; New Jersey; Kansas; Florida. Evidently this species is generally distributed at least over the eastern half of the United States.

Hosts.—*Diacrisia virginica* Fabricius (Riley, Ashmead); *Olene* (?) *clintoni* Grote and Robinson (Ashmead); *Acronycta oblinita* Smith and Abbot; *Acronycta brumosa* Guenée.[1]

Cocoons.—Gregarious, completely embedded in a mass of whitish silk.

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[1] Ins. Life, vol. 3, p. 15.

As the result of a most careful study of the types of the species listed in the synonymy the writer is of the opinion that they are representatives of *scitulus*.

Besides the types of this species and those of the two species placed in synonymy, the National Collection contains specimens as follows: Three specimens from Lincoln, Nebraska, reared by L. Bruner from *Acronycta oblinita;* a large series from Prince Georges County, Maryland, collected by A. B. Gahan; 4 specimens from Knoxville. Tennessee, collected by G. N. Bentley; 11 specimens from Brunswick, New Jersey, collector not indicated; 14 specimens bearing Bureau of Entomology No. 360a, reared December 7, 1886, from *Acronycta oblinata*, locality not indicated; 1 specimen from Lawrence, Kansas, collected by Hugo Kahl; and a large series from Paradise Keys, Florida, collected by Barber and Schwarz.

106. APANTELES XYLINUS (Say).

Microgaster xylinus SAY, Boston Journ. Nat. Hist., vol. 1, pt. 3, 1836, p. 262.

Apanteles xylinus Say, PROVANCHER, Addit. faun. Canada, Hymenop., 1888, p. 388.

Apanteles (Protapanteles) cushmani VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 144.

Apanteles (Protapanteles) oxyacanthoidis VIERECK, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 581.

Apanteles (Protapanteles) lanificus VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, pp. 188, 196.

Habitat.—Very generally distributed over the eastern half of the United States and southern Canada, and occurring as far west as Colorado. Very common.

Host.—*Agrotis c-nigrum* Linnaeus; "cutworms."

Cocoons.—Gregarious, enclosed in a compact ball of whitish silk.

A careful study of the type material has convinced the writer that the species listed in the synonymy are *xylinus* Say.

The National Collection contains, in addition to the type series and the type material of the listed synonyms, numerous series of this species from widely distributed localities. Several of these series are recorded as having been reared from *Agrotis c-nigrum;* others are labeled as having been reared from cutworms, but so far as known *A. c-nigrum* is the only identified host. One lot of specimens bred from *A. c-nigrum* bears Bureau of Entomology No. 2486°, but is without locality or collector labels. Another series from the same host was reared by H. Severin at Racine, Wisconsin. The writer has also seen material of this species in the collections of the Iowa, Illinois, Kansas Agricultural Experiment Stations, in the collection of the Gypsy Moth Laboratory, at Melrose Highlands, Massachusetts. and in that of Cornell University.

107. APANTELES YAKUTATENSIS Ashmead.

Apanteles yakutatensis Ashmead, Proc. Wash. Acad. Sci., vol. 4, 1902, p. 249.
Apanteles (*Protapanteles*) *hyslopi* Viereck, Proc. U. S. Nat. Mus., vol. 38, 1910, p. 379.

Habitat.—Alaska; Washington; Utah.

Hosts.—*Autographa gamma*, var. *californica* Speyer (Viereck); *Agrotis c-nigrum* Linnaeus.

Cocoons.—Gregarious, enclosed in a firm mass of whitish silk.

The types of *yakutatensis* and *hyslopi* have been compared, and the writer is of the opinion that they represent the same species. It is quite possible that *yakutatensis* is but a geographical form of *xylinus*, which it resembles structurally and biologically, differing only in its darker coloring.

Besides the types of this species and those of its synonym, the National Collection contains the following material: Six specimens from Forest Grove, Oregon, reared by L. P. Rockwood from *Agrotis c-nigrum* under Webster No. 18456; five specimens, under Quaintance No. 15454, from Seaview, Washington, collected by H. K. Plank, are without host record; another small series from Grayland, Washington, is without host or collector's labels. The writer has also seen a series from Utah.

108. APANTELES CRAMBI Weed.

Apanteles crambi Weed, Bull. Ill. State Labor. Nat. Hist., vol. 3, 1887, p. 8.

Habitat.—Illinois; Ohio; Maryland; Tennessee; South Dakota.

Hosts.—*Crambus trisectus* Walker; *C. mutabilis* Clemens; *C. zeellus* Fernald (Weed).

Cocoons.—White; gregarious, in cocoon of host.

This species is represented in the National Collection by 1 specimen from Champaign, Illinois, reared from *Crambus trisectus;* 6 specimens from Wooster, Ohio, labeled as parasitic on the corn web-worm, reared by F. M. Webster, July 7, 1885; 1 specimen from Maryland without further data; a series of 15 specimens from Nashville, Tennessee, reared from *Crambus mutabilis* by G. G. Ainslie, under Webster No. 12358; and a series from Elk Point, South Dakota, reared from *Crambus mutabilis.*

109. APANTELES PLATHYPENAE, new species.

Very similar to *laeviceps*, from which it differs in the venter of the abdomen being usually entirely yellowish, in the disk of the scutellum being weakly punctate, and in the much larger stigma.

Female.—Length, 2.2 mm. Head with the vertex, temples, and cheeks smooth and very strongly shining; antennae almost or quite as long as the body; mesoscutum with numerous distinct sharp punctures, more scattered at the sides and posteriorly; disk of scutellum slightly convex, indistinctly punctate and shining; mesopleura closely punctate anteriorly, highly polished posteriorly; propodeum rugoso-reticulate, with a median longitudinal carina; posterior coxae closely punctate and strongly pubescent, yet somewhat shining; spurs of posterior tibiae apparently equal in length and not distinctly half as long as the metatarsus; forewing with the stigma very large, at least half as long as the distance from its base to the base of the wing, and distinctly a little longer than the metacarpus; the inner side of the stigma almost twice as long as the outer; abdomen oval; the first tergite broadening gradually from base to apex, and together with the rectangular second tergite entirely rugose; suturiform articulation, rather broad and roughened; third and following tergites smooth and polished, except that rarely there are a few weak striulae at the extreme base of the third plate in the middle; ovipositor subexserted. Black; antennae and tegulae blackish; wings hyaline, the stigma and veins very pale brown, the stigma almost transparent; legs yellowish, except all coxae, which are black, the extreme apex of posterior femora and of posterior tibiae, and most of the posterior tarsi, which are dusky; abdomen black, with more or less testaceous laterally on the third tergite, and with the third and following dorsal segments giving off strong bluish reflections; venter of the abdomen entirely yellowish.

Male.—Essentially as in the female.

Type locality.—Wellington, Kansas.

Type.—Cat. No. 22538, U.S.N.M.

Host.—*Plathypena scabra* Fabricius.

Described from two females and one male bred by T. H. Parks in the Bureau of Entomology, under Webster No. 5471.

110. APANTELES AUTOGRAPHAE, new species.

Very close to *plathypenae*, but differs in the smaller and darker stigma, in the stigma being a little shorter than the metacarpus, and in the posterior coxae being very coarsely granular, rather than closely punctate, on the outer face.

Female.—Length, 2.2 mm. Head indistinctly punctate and strongly shining; temples rather broad; mesoscutum closely punctate medially, almost impunctate posteriorly and at the sides; disk of the scutellum slightly convex, indistinctly punctate and strongly shining; mesopleura polished, except below and anteriorly, where they are uniformly punctate; propodeum coarsely roughened, and with a distinct median longitudinal carina; stigma normal, not longer than metacarpus, and not distinctly half the length of the distance from its base to the base of wing; posterior coxae very coarsely granular and dull on the outer face; inner spur of posterior tibiae not longer than the outer, and not longer than half the metatarsus; abdomen elongate-oval; the first tergite broadening gradually posteriorly, and, like the almost rectangular second tergite, coarsely rough; third and following tergites smooth and shining; ovipositor subexserted. Black; antennae and tegulae black; wings hyaline, the stigma and veins dark brown; all coxae black; remainder of legs entirely yellow, the posterior femora not at all fuscous at apex; third abdominal tergite usually testaceous laterally; venter of the abdomen entirely testaceous.

Type locality.—Baton Rouge, Louisiana.

Type.—Cat. No. 22539, U.S.N.M.

Host.—*Autographa brassicae* Riley.

Described from three female specimens bred by C. E. Smith, of the Bureau of Entomology, under Chittenden No. 4177–1.

111. APANTELES GRIFFINI (Viereck).

Apanteles (*Protapanteles*) *griffini* VIERECK, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 177.

Habitat.—Widely distributed over the eastern half of the United States and occurring as far west as Kansas.

Host.—*Feltia gladiaria* Morrison; "cutworms"; apparently a general parasite of cutworms.

Cocoons.—Dirty whitish to pale buff; gregarious, heaped together, but not inclosed in a ball of silk.

Very closely related to *laeviceps*, and possibly only a geographical form of that species; the body is short-ovate. The posterior coxae are usually not so granular as in *laeviceps;* and the female antennae have the basal flagellar segments pale.

This species is represented in the National Collection by many series of specimens, in addition to the type material. The only identified host recorded among this great mass of material is *Feltia gladiaria*, from which the species was reared at Clarksville, Tennessee, by G. A. Runner.

112. APANTELES LAEVICEPS Ashmead.

Apanteles laeviceps ASHMEAD, Bull. Colorado Biol. Assoc., No. 1, 1890, p. 17.—WEBSTER, Journ. Econ. Ent., vol. 4, 1911, p. 181.

Habitat.—General over the United States and lower Canada; apparently restricted, however, to the higher elevations.

Hosts.—*Cirphis unipuncta* Haworth; *Autographa brassicae* Riley; *Autographa*, species; *Scotogramma*, species; *Eurymus eurytheme* Boisduval; *Chorizagrotis agrestis* Grote; *C. auxilaris* Grote; *Laphygma exigua* Hübner; *Neleucania albilinea* Hübner (Webster).

Cocoons.—Dirty whitish to pale buff; gregarious and heaped together irregularly; inseparable from those of *griffini.*

Besides the type series the National Collection contains a vast amount of material of this species, among which are the following interesting records: Maxwell, New Mexico, reared from *Chorizagrotis agrestis* by D. J. Caffrey, under Webster No. 11131; Salt Lake, Utah, reared by L. P. Rockwood from *Autographa*, species, under Webster No. 7489; Murray, Utah, reared from *Scotogramma*, species, by L. P. Rockwood, under Webster No. 10320; Maxwell, New Mexico, reared from *Eurymus eurytheme* by D. J. Caffrey, under Webster No. 11202; Maxwell, New Mexico, reared from *Cirphis unipuncta* by C. K. Wildermuth, under Webster No. 11154; Rocky Ford, Colorado, reared from *Laphygma exigua* by H. O. Marsh, under Chittenden No. 1562; a large series from the army worm, *Cirphis unipuncta*, reared by Dr. James Fletcher at Ottawa, Canada; and a large series reared from cocoons taken on *Carex* on Mount Washington, New Hampshire.

113. APANTELES ROBINIAE (Fitch).

Microgaster robiniae FITCH, Fifth Ann. Rep. on Noxious, Beneficial, and Other Insects of the State of New York, 1859, p. 836.

Apanteles (*Protapanteles*) *robiniae* Fitch, VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, p. 196.

Habitat.—New York.

Host.—*Recurvaria robiniella* Fitch (Fitch).

Cocoons.—"White, solitary, within the mine of the host." (Fitch.)

Known only from the type material in the National Collection.

114. APANTELES ORNIGIS Weed.

Apanteles ornigis WEED, Bull. Ill. State Labor. Nat. Hist., vol. 3, 1887, p. 6.

Apanteles tortricis ASHMEAD, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 163.

Apanteles (*Apanteles*) *braunae* VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 614.

Apanteles (*Apanteles*) *lithocolletidis* VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 615.

Habitat.—Illinois; New Hampshire; Minnesota; Massachusetts; Pennsylvania; New York; Virginia; District of Columbia; Kentucky; Missouri.

Hosts.—*Ornix geminatella* Packard (Weed); *Lithocolletis mariaeella* Chambers; *Lithocolletis*, species (Viereck); *Lithocolletis propinquinella* Braun; *Tischeria*, species.

Cocoons.—Smooth, white, with a darker transverse median band, the cocoon being much thinner here than at the ends; solitary.

After a careful study of the type material under the names listed above, the writer is of the opinion that the four names have been applied to a single variable species.

Besides the types of *ornigis* and of its three synonyms the National Collection contains the following material: Several specimens from North East, Pennsylvania, reared from *Ornix geminatella* by D. Isely under Quaintance No. 10972; specimens from Washington, District of Columbia, reared from *Lithocolletis propinquinella* by C. R.

Ely; specimens from Falls Church, Virginia, reared by C. Heinrich from *Tischeria*, species in oak, under Hopk. U. S. No. 12100*e*; specimens from Lexington, Kentucky, reared from a leaf-miner in *Aesculus*, collector not indicated; and specimens from Kirkwood, Missouri, reared from *Lithocolletis mariaeella* by Miss M. E. Murtfeldt.

115. APANTELES BEDELLIAE (Viereck).

Apanteles (*Protapanteles*) *bedelliae* VIERECK, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 174.

Habitat.—District of Columbia; Louisiana; Virginia; New York; Arizona.

Hosts.—*Bedellia minor* Busck; *B. somnulentella* Zeller; *Proleucoptera albella* Chambers; *Recurvaria thujaeella* Kearfott; *Anomis erosa* Hübner.

Cocoons.—White, small, gregarious, loosely grouped together.

The National Collection contains, in addition to the types, specimens reared from *Bedellia minor* at Baton Rouge, Louisiana, by C. E. Smith, under Chittenden No. 4030; specimens from Westbury, Long Island, reared by C. Heinrich from *Recurvaria thujaeella* under Hopk. U. S. No. 12188b[1]; specimens from Washington, District of Columbia, reared from *Anomis erosa* by H. M. Russell; specimens from Tempe, Arizona, reared from *Proleucoptera albella* by D. J. Caffrey; specimens from Vienna, Virginia, reared from a leaf-miner of morning-glory, *Ipomaea*, by R. A. Cushman; specimens labeled "parasite on miner in *Convolvulus*," without further data; and a series under Bureau of Entomology No. 2518°, labeled as having been reared from *Bedellia somnulentella*, the locality and collector not given.

116. APANTELES ROHWERI, new name.

Apanteles nigripes ROHWER, Proc. Ent. Soc. Wash., vol. 15, 1913, p. 187 (not *nigripes* Ratzeburg, Ichn. d. Forstins., vol. 1, 1844, p. 71).

Habitat.—Virginia.

Host.—(*Gracilaria*) *Acrocercops strigifinitella* Clemens.

Besides the type of this species the National Collection contains two specimens reared by C. Heinrich, at the same place and from the same host as the type.

117. APANTELES EMPRETIAE (Viereck).

Apanteles (*Protapanteles*) *empretiae* VIERECK, Proc. U. S. Nat. Mus., vol. 44, 1913, p. 562.

Apanteles (*Apanteles*) *sibinidis* ROHWER, Proc. U. S. Nat. Mus., vol. 49, 1915, p. 227.

Apanteles empretiae Viereck (=*Apanteles sibinidis* Rohwer) GAHAN, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 121.

Habitat.—District of Columbia; Virginia; Florida; New Jersey.

Hosts.—*Sibine stimulea* Clemens (Viereck; Rohwer); *Parasa chloris* Herrich-Schaeffer.

Cocoons.—Buff in color; gregarious, without loose silk, and attached vertically to the body of the host.

There are in the United States National Museum, besides the types of *empretiae* and its synonym, specimens from Falls Church, Virginia, reared by C. Heinrich from *Parasa chloris* on chestnut, under Hopk. U. S. No. 11197^h; also specimens from Miami, Florida, reared by Max Kisliuk from an unidentified caterpillar under Hunter No. 9035.

118. APANTELES DIACRISIAE Gahan.

Apanteles diacrisiae GAHAN, Proc. U. S. Nat. Mus., vol. 53, 1917, p. 198.

Habitat.—Apparently widely distributed over the eastern half of the United States.

Hosts.—*Diacrisia virginica* Fabricius (Gahan); *Hemerocampa leucostigma* Smith and Abbot; *Hyphantria textor* Harris; *Olene clintoni* Grote.

Cocoons.—Gregarious, entirely inclosed in a mass of tough white silk.

In addition to the type series the National Collection contains a large amount of material of this species, reared from *Diacrisia virginica*, in widely different localities; also two specimens from Washington, District of Columbia, said to have been reared from *Hemerocampa leucostigma* by W. H. White, under Chittenden No. 908; another series bearing Bureau of Entomology No. 382L, said to have been reared from *Olene clintoni;* and a series from Columbia, South Carolina, reared from *Hyphantria textor* under Bureau of Entomology No. 484L°.

119. APANTELES DEPRESSUS (Viereck).

Apanteles (*Stenopleura*) *depressus* VIERECK, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 582.

Habitat.—Indiana.

Host.—Tortricid larva (Viereck).

Represented in the National collection by the type series only.

120. APANTELES PYRALIDIS, new species.

Female.—Length, 2.2 mm. Face broader than long, punctate; antennae shorter than the body, apical segments very short; vertex and temples indistinctly punctate and shining; mesoscutum rather closely punctate and opaque, except along the posterior margin; scutellum with the disk practically impunctate, very shining, and the lateral face mostly roughened, the posterior polished area on the lateral face of scutellum being very small, semicircular in outline; mesopleura polished except anteriorly; propodeum entirely rugose and opaque, without a median carina; radius as long as, or a little longer than, the transverse cubitus, the two veins uniting in a strong angle; posterior coxae smooth and shining; abdomen moderately broad and hardly as long as the thorax; first tergite about as broad at apex as at base, the sides bulging slightly, hardly one and one-half times as long as broad at apex, uniformly rugose; second tergite trapezoidal, as broad at base as first tergite is broad at apex, and broader at apex than at base, like the first tergite uniformly rugose and opaque; remainder of the abdomen smooth and shining, except for very slight roughening at the base of the third tergite; lateral membranous margins along the apical half of the first tergite and the entire length of the second rather broad; ovipositor subexserted. Black; antennae blackish, except the scape, which is somewhat pale beneath; tegulae black; legs entirely testaceous, except the base of all coxae, and the apex of the posterior femora and tibiae, and most of the posterior tarsi, which are dusky; lateral membranous margins on the two basal abdominal tergites, also the venter of the abdomen on the basal half, testaceous; wings hyaline, with the stigma and veins pale brown.

Male.—As in the female, except that the antennae are considerably longer than the body, and the coxae are usually more blackish.

Cocoons.—Small, white, gregarious, but not inclosed in a mass of silk.

Type locality.—Prince Georges County, Maryland.

Type.—Cat. No. 22540, U.S.N.M.

Described from many specimens of both sexes parasitic on various species of Pyralidae; specimens in the United States National Museum are recorded from *Nomophila noctuella* Denis and Schiffermueller; *Pyrausta futilalis* Lederer; and *Loxostege similalis* Guenée.

121. APANTELES PALEACRITAE Riley.

Apanteles paleacritae Riley, Trans. Acad. Sci. St. Louis, vol. 4, pt. 2, 1881, p. 313.

Protapanteles ephyrae Ashmead, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 163.

Habitat.—Illinois; Canada; New Hampshire; Massachusetts.

Hosts.—(*Paleacrita*) *Nyctobia anguilineata* Grote and Robinson (Riley); *Cosymbia lumenaria* Huebner (Ashmead); *Alsophila pometaria* Harris.

A careful study of the types of *paleacritae* and *ephyrae* shows beyond question that they are identical.

Besides the type material the National Collection contains one specimen from Bentonville, Arkansas, reared by D. Isely under Quaintance No. 16355, said to have been parasitic on the canker worm.

122. APANTELES EUCHAETIS Ashmead.

Apanteles euchaetis Ashmead, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 159.

Habitat.—New Hampshire; Massachusetts; Illinois; Virginia.

Host.—*Euchaetias egle* Drury (Ashmead).

Cocoons.—White, gregarious, packed inside the cocoon of the host.

In addition to the type series the National collection contains one specimen of this species labeled as having been bred from *Euchaetias* *egle* by S. A. Forbes; and eight specimens bearing Bureau of Entomology No. 171°, February 12, 1884, without further data. The writer has also seen several series of this species in the collection of the Gipsy Moth Laboratory, at Melrose Highlands, Massachusetts, which were reared from *Euchaetias egle* at Melrose Highlands.

123. APANTELES HALLII (Packard).

Microgaster hallii PACKARD, Amer. Natural., vol. 11, 1877, p. 52.

Apanteles hallii Packard, WEED, Trans. Amer. Ent. Soc., vol. 15, 1888, p. 295.

Habitat.—Polaris Bay.

Host.—Unknown.

Known only from the type series in the United States National Museum.

124. APANTELES ATALANTAE (Packard).

Microgaster (? Apanteles) atalantae PACKARD, Proc. Boston Soc. Nat. Hist., vol. 21, 1881, p. 27.

Apanteles congregatus, var. *atalantae* Packard, RILEY, Amer. Natural., vol. 16, 1882, p. 679.

Apanteles atalantae Packard, RILEY, in Scudder, Butterflies U. S., 1889, p. 1908.

Habitat.—Massachusetts; New Jersey; Michigan; Canada; apparently generally distributed over the Northeastern States.

Hosts.—*Vanessa atalanta* Linnaeus (Packard); *Aglais milberti* Godart (Riley).

Cocoons.—Gregarious, imbedded in small masses of pure white silk.

The National Collection contains, in addition to the large type series, a specimen of this species from Ottawa, Canada, reared by T. W. Fyles from *Aglais milberti*; and specimens from Agricultural College, Michigan, without further data. The writer has also seen many series of this species, reared from the above-named hosts, in the collection of the Gipsy Moth Laboratory at Melrose Highlands, Massachusetts.

125. APANTELES THECLAE Riley.

Apanteles theclae RILEY, Trans. Acad. Sci. St. Louis, vol. 4, pt. 2, 1881, p. 308; in Scudder, Butterflies U. S., 1889, p. 1906.

Apanteles glomeratus, var. *theclae* Riley, PATTON, Psyche, vol. 6, 1892, p. 261.

Parapanteles theclae Riley, ASHMEAD, Proc. U. S. Nat. Mus., 1900, vol. 23, p. 131.

Habitat.—Georgia; Alabama; Texas; Kansas; Oklahoma; Missouri.

Hosts.—*Thecla*, species (Riley); (*Uranotes*) *Strymon melinus* Hübner; (*Lycaena*) *Everes comyntas* Godart.

Cocoons.—White; gregarious, loosely grouped together.

Besides a large type series there is in the National Collection the following material: A series from Dallas, Texas, reared by W. D. Pierce from (*Uranotes*) *Strymon melinus* on cotton; a series from

Wellington, Kansas, reared by T. S. Wilson under Webster No. 12442; a small series from Sweetwater, Oklahoma, reared by H. Hines from *Strymon melinus*; and two specimens sent in from Missouri by W. H. Edwards labeled as probably parasitic on (*Lycaena*) *Everes comyntas*.

126. APANTELES ELECTRAE (Viereck).

Apanteles (*Protapanteles*) *electrae* VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 145.

Habitat.—California; Arizona; New Mexico.

Hosts.—*Hemileuca electra* Wright (Viereck); *Hemileuca nevadensis* Stretch; *Pseudohazis hera* Harris; *P. eglanterina* Boisduval; *Agapema galbina* Clemens.

Cocoons.—White; gregarious, attached separately to the back of the host, and not surrounded by loose silk.

Very close to *hemileucae*, from which it differs only in the darker tegulae and legs.

Represented in the United States National Museum by the types and the following additional material: Twelve specimens reared from *Hemileuca nevadensis*, at Maxwell, New Mexico, by D. J. Caffrey; five specimens bred from *Pseudohazis eglanterina* at Santa Rosa, California; a small series bearing Bureau of Entomology No. 359°, from San Bernardino, California, reared from *Pseudohazis hera*; a series from Los Angeles, California, reared, under Bureau of Entomology No. 532, from *Hemileuca*, species; a series under Bureau of Entomology No. 391, from Arizona, bred from *Agapema galbina* Clemens; and several additional specimens from California and New Mexico.

127. APANTELES MELANOSCELUS (Ratzeburg).

Microgaster melanoscelus RATZEBURG, Ichn. d. Forstins., vol. 1, 1844, p. 74.

(*Microgaster melanoscelus* Ratzeburg) =*Apanteles difficilis* Nees, MARSHALL, Trans. Ent.. Soc. London, 1885, p. 187.

Habitat.—Europe; and New England, over the gipsy-moth area.

Host.—*Porthetria dispar* Linnaeus.

Cocoons.—Yellowish-green; solitary.

This species, introduced from Europe as an enemy of the gipsy moth, and successfully established in the gipsy-moth area in New England, is very close to *solitarius*, which it resembles biologically as well as structurally; possibly it is not more than a variety of that species, differing only in the blackish posterior femora, and in the third abdominal tergite being somewhat less roughened. There can be no question that Marshall erred in placing *melanoscelus* in the synonymy of *difficilis*.

Represented in the United States National Museum by several specimens bred from the gypsy moth in Europe, and by several others reared from the same host in Massachusetts. The writer has also had the opportunity of studying a vast amount of material of this species at the Gipsy Moth Laboratory, at Melrose Highlands, Massachusetts.

128. APANTELES FLAVICONCHAE Riley.

Apanteles limenitidis form *flaviconchae* RILEY, Trans. Acad. Sci. St. Louis, vol. 4, pt. 2, 1881, p. 308.

Apanteles (*Protapanteles*) *flaviconchae* Riley, VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, p. 193.

Habitat.—Missouri; Connecticut; Massachusetts; Maine; Maryland; West Virginia; apparently very widely distributed at least over the eastern half of the United States.

Hosts.—*Cirphis unipuncta* Haworth (Riley); *Eurymus philodice* Godart; *Anthocharis genutia* Fabricius; *Plathypena scabra* Fabricius.

Cocoons.—Bright yellow; gregarious and losely heaped together.

The National Collection contains, besides the types, many series from widely distributed localities, but giving few host records. One series from Branford, Connecticut, is said to have been taken with the army worm (presumably *Cirphis unipuncta*); another series from Agawam, Massachusetts, reared by H. E. Smith, is said to be from *Eurymus*, species. Two specimens from Orono, Maine, are labeled as reared from *Eurymus philodice;* another lot of specimens from Hagerstown, Maryland, are recorded from the same host by W. E. Pennington. One specimen from Coalburgh, West Virginia, is said to have been reared from *Anthocharis genutia.* The writer has also seen a series reared by F. H. Chittenden, at College Park, Maryland, from *Plathypena scabra.*

129. APANTELES KOEBELEI Riley.

Apanteles koebelei RILEY, in Scudder, Butterflies U. S., 1889, p. 1904.

Habitat.—California.

Host.—*Euphydryas editha* Boisduval (Riley).

Known only from the type series in the United States National Museum.

130. APANTELES ANISOTAE, new species.

Female.—Length, 2 mm. Face much broader than long, punctate and rather opaque; vertex indistinctly punctate and shining; mesoscutum rather strongly punctate, more closely so where the parapsidal furrows would be if present, somewhat opaque; scutellum with the disk slightly convex, weakly punctate, and strongly shining, and the lateral face with the posterior polished area semicircular, and occupying much less than half of the entire area of the lateral face; mesopleura highly polished, with a deep, inconspicuously roughened depression near the apex; propodeum uniformly rugulose and shining, with a distinct median longitudinal carina; metacarpus about as long as the stigma, the radius slightly longer than the transverse cubitus, and uniting with it in a strong angle; nervellus directed strongly toward base of wing; posterior coxae mostly smooth and shining with a conspicuous, punctate, oval, flattened area on the outer edge at base; inner spur of posterior tibiae somewhat longer than the outer, and more than half the length of the metatarsus; abdomen rather short, ovate; the first tergite broadening gradually from the base to the apex, smooth and highly polished on the basal half, punctate and opaque on the apical half; second tergite trapezoidal, more than twice as broad as long, the sides oblique on the basal half, parallel on the apical half, posterior margin practically straight, the tergite very finely, indistinctly rugulose and opaque; remainder of the abdomen perfectly smooth and very highly polished; ovipositor subexserted. Black; antennae entirely, tegulae, all coxae, basal trochanters, and the posterior femora, and entire abdomen, black; base of middle femora, apex of posterior tibiae and the posterior tarsi, dusky; wings hyaline, stigma and veins brown.

Cocoons.—Deep buff in color; gregarious, but not inclosed in a ball of silk, and with almost no loose silk about each one.

Type locality.—Falls Church, Virginia.

Type.—Cat. No. 22541, U.S.N.M.

Host.—*Anisota senatoria* Smith and Abbot.

Described from two female specimens bred by Miss Ada Kneale, in the Bureau of Entomology, under Quaintance No. 14501.

131. APANTELES NITENS, new species.

In structure practically identical with *griffini;* differs from that species, however, in the black legs and the entirely black and somewhat longer antennae.

Female.—Length 2 mm. Head weakly punctate, shining; face with a rather distinct median ridge below antennae; mesoscutum distinctly but not closely punctate; scutellum with the disk entirely impunctate and very highly polished, the lateral face mostly smooth and shining; mesopleura somewhat punctate anteriorly and below, polished behind; propodeum coarsely rugose, with a rather distinct median longitudinal carina; inner side of the stigma almost or quite twice as long as the outer; metacarpus not longer than stigma; radius shorter, or at least no longer, than the transverse cubitus; posterior coxae slightly granular above, smooth and shining on the outer face; posterior femora slender; spurs of posterior tibiae about equal in length and a little less than half the length of the metatarsus; abdomen rather short-oval; the first abdominal tergite much broader at apex than at base; the second broad, rectangular, with the posterior margin slightly curved forward at the sides; first and second tergites rugulose, though shining; the remainder of the abdomen perfectly smooth and highly polished; ovipositor subexserted. Black; antennae, tegulae, all coxae, and trochanters, basal half of fore femora, middle and hind femora entirely, black; tibiae largely testaceous, the posterior pair blackish on the apical third; tarsi dusky; wings very slightly infumated, the stigma and veins brown.

Male.—Differs in no essential character from the female.

Type locality.—Forest Grove, Oregon.

Type.—Cat. No. 22553, U.S.N.M.

Host.—*Feltia aeneipennis* Grote.

Described from six female and two male specimens bred by L. P. Rockwood, October 18. 1916, in the Bureau of Entomology, under Webster No. 18448.

132. APANTELES CARDUICOLA (Packard).

Microgaster (*Apanteles* ?) *carduicola* PACKARD, Proc. Boston Soc. Nat. Hist., vol. 21, 1881, p. 27.

Apanteles carduicola Packard, WEED, Trans. Amer. Ent. Soc., vol. 15, 1888, p. 296.—RILEY, in Scudder, Butterflies U. S., 1889, p. 1907; SCUDDER, Butterflies U. S.. 1889, p. 469.

Habitat.—United States; Nipigon Forest Reserve, Canada.

Hosts.—*Vanessa cardui* Linnaeus (Packard); *V. virginiensis* Drury (Scudder).

Known only from the type series in the United States National Museum.

133. APANTELES HESPERIDIVORUS (Viereck).

Apanteles (*Protapanteles*) *hesperidivorus* VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 626.

Habitat.—Connecticut.

Host.—Hesperid on oak (Viereck).

Known only from the type series in the United States National Museum.

134. APANTELES CYANIRIDIS Riley.

Apanteles cyaniridis RILEY, in Scudder, Butterflies U. S., 1889, p. 1903.

Habitat.—United States.

Host.—*Lycaenopsis pseudargiolus* Boisduval and LeConte.

Cocoon.—White, with a tinge of lemon-yellow; solitary.

A stout species, with an exceptionally broad abdomen.

Known only from the type series in the United States National Museum.

135. APANTELES ACAUDUS (Provancher).

Microgaster acaudus PROVANCHER, Addit. faun. Canad. Hymenop., 1886, pp. 139, 142.

Apanteles acaudus PROVANCHER, Addit. faun. Canad. Hymenop., 1888, p. 388.

Habitat.—Canada.

Host.—Unknown.

Very distinct, in possessing especially long spurs on posterior tibiae, the inner spur being about three-fourths the length of the metatarsus.

The writer has seen only a single specimen of this species. This specimen, which is in the United States National Museum, was compared with the type, which is in the Museum of Public Instruction at Quebec, by A. B. Gahan and made a homotype. It is without locality or host labels.

136. APANTELES ARGYNNIDIS Riley.

Apanteles argynnidis RILEY, in Scudder, Butterflies U. S., 1889, p. 1904.

Habitat.—West Virginia; District of Columbia; California.

Host.—*Argynnis cybele* Fabricius (Riley); *Argynnis*, species.

Cocoons.—Small, whitish, gregarious, not inclosed in a mass of silk.

Besides the type series the National Collection contains two specimens from Placer County, California, said to have been reared from an unidentified species of *Argynnis*.

137. APANTELES PRENIDIS, new species.

Female.—Length, 2.5 mm. Head strongly shining; face very minutely punctate; vertex and temples mostly polished; antennae almost as long as the body; mesoscutum with sharp separate punctures on the anterior two-thirds, practically impunctate and polished posteriorly; disk of scutellum very flat, entirely impunctate and highly polished; mesopleura distinctly punctate anteriorly, polished behind; propodeum coarsely rugoso-reticulate, with a very prominent median longitudinal carina, opaque; radius not, or indistinctly, longer than the transverse cubitus; posterior coxae smooth and strongly shining; inner spur of posterior tibiae slightly longer than the outer and about half as long as the metatarsus; abdomen broad-oval; first abdominal tergite broader at apex than at base, ruguloso-punctate; second tergite broad, almost rectangular, only indistinctly roughened, mostly smooth and shining; sutüriform articulation foveolate laterally; third and following tergites smooth and polished; ovipositor sheaths hardly exserted. Black; antennae entirely brownish-black; tegulae black; legs testaceous, except all coxae, which are black, and the extreme apex of the posterior femora, which is dusky; abdomen entirely black above and below.

Type locality.—Luguillo, Porto Rico.

Type.—Cat. No. 22549, U.S.N.M.

Host.—(*Prenes*) *Calpodes ares* Felder. Described from eight female specimens bred by T. H. Jones.

138. APANTELES PODUNKORUM (Viereck).

Apanteles (*Stenopleura*) *podunkorum* VIERECK, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 583.

Habitat.—Connecticut; Virginia.

Host.—*Pyrausta futilalis* Lederer.

Cocoons.—White; gregarious, loosely heaped together.

Very close to *pyraustae*, and sometimes separated with difficulty: usually, however, the characters given in the foregoing table will suffice to distinguish the species.

The National Collection possesses, in addition to the type series, a lot of six specimens reared from *Pyrausta futilalis* at Vienna, Virginia, by R. A. Cushman.

139. APANTELES PYRAUSTAE (Viereck).

Apanteles (*Protapanteles*) *pyraustae* VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 626.

Habitat.—Connecticut.

Host.—*Pyrausta futilalis* Lederer (Viereck).

Cocoons.—White; gregarious, but not inclosed in a ball of silk. Known only from the type series in the United States National Museum.

140. APANTELES PHOBETRI (Rohwer).

Apanteles (*Protapanteles*) *phobetri* ROHWER, Proc. U. S. Nat. Mus., vol. 49, 1915, p. 228.

Habitat.—Virginia; Massachusetts; Kentucky; Kansas; Indiana.

Hosts.—*Phobetron pithecium* Smith and Abbot (Rohwer); *Halisidota tesselaris* Smith and Abbot.

Cocoons.—Pale buff; gregarious, but formed separately on the back of the host caterpillar, and not surrounded by loose silk.

The National Collection contains, in addition to the type series, three specimens of this species reared at Lexington, Kentucky, from *Halisidota tesselaris* by H. Garman, and bearing Accession No. 2603 of the Kentucky Agricultural Experiment Station; one specimen, without locality label, said to have been reared from *H. tesselaris;* a series from *Halisidota* on sycamore at Wells, Kansas; and a series from Mount Vernon, Indiana, reared from an unknown lepidopterous larva by J. J. Davis.

141. APANTELES DELICATUS Howard.

Apanteles delicatus HOWARD, Bull. U. S. Dept. Agric., Bur. Ent., Tech. Ser., 5, 1897, p. 54.

Habitat.—District of Columbia; Connecticut.

Host.—*Hemerocampa leucostigma* Smith and Abbot.

Cocoons.—White; solitary.

Known only from the types in the United States National Museum.

142. APANTELES ALGONQUINORUM (Viereck).

Apanteles (*Protapanteles*) *algonquinorum* VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Surv., 1916, pp. 188, 196.

Habitat.—Connecticut.

Host.—Unknown.

Known only from the types in the United States National Museum.

143. APANTELES TMETOCERAE, new species.

Female.—Length, 3.3 mm. Face somewhat roughened medially, with a distinct sharp median ridge originating just below the insertion of the antennae and extending halfway to the clypeus; vertex somewhat punctate, rather shining; mesoscutum closely sharply punctate; scutellum with the disk convex, practically impunctate and very shining; suture at the base of the disk broad, with numerous conspicuous pits; mesopleura largely polished, with a shallow, noncrenulate depression posteriorly; propodeum rugose, with a rather distinct median longitudinal carina and with costulae; forewing with the stigma large, and with the radius strongly directed backward, very slightly longer than the transverse cubitus and uniting with the latter in a sharp angle; nervellus strongly curved toward base of wing; posterior coxae large, shining; inner spur of posterior tibiae but very slightly longer than the outer, and about half as long as the metatarsus: abdomen longer than the thorax, stout; the first tergite broadening gradually from base to apex, the apical angles rounded, the plate somewhat punctate or weakly roughened on the posterior half; second tergite subtrapezoidal, two-thirds as long as the first tergite is broad at apex, one and one-half times as broad at apex as long down the middle, and slightly broader at apex than at base, feebly rugulose and somewhat shining; remainder of the abdomen smooth and shining; ovipositor subexserted. Black; antennae entirely black; tegulae dark brown; wings hyaline, with the stigma and veins dark brown, even the subdiscoideus strongly pigmented all the way to the margin of the wing; all coxae black; remainder of the legs testaceous, except the extreme apex of the posterior femora above and most of the posterior tarsi, which are blackish; sides of the venter of the abdomen yellowish on the basal half.

Male.—Essentially as in the female.

Type locality.—Nova Scotia, Canada.

Type.—Cat. No. 22554, U.S.N.M.

Host.—*Tmetocera ocellana* Schiffermueller.

Described from one specimen of each sex bred by Mr. W. H. Brittain.

144. APANTELES OROBENAE Forbes.

Apanteles orobenae FORBES, Rep. Noxious Insects Ill., vol. 12, 1882, p. 104.
Apanteles congregatus, var. *orobenae* Forbes, WEED, Bull. Ill. State Labor. Nat. Hist., Vol. 3, 1887, p. 5.

Habitat.—Illinois; Louisiana; (?) Connecticut.

Host.—*Evergestis rimosalis* Guenée (Forbes).

This is without question a distinct species, and should not be regarded as a variety of *congregatus*, as suggested by Weed.

The National Collection contains two specimens received from S. A. Forbes, and which are undoubtedly paratypes; also a series from Baton Rouge, Louisiana, reared from *Evergestis rimosalis* by T. H. Jones under Chittenden No. 4199–1; and a series from Illinois. reared from the same host under Bureau of Entomology No. 2243°.

145. APANTELES HYDRIAE, new species.

Female.—Length, 2.2 mm. Face weakly punctate, somewhat shining; vertex indistinctly punctate and shining; antennae distinctly shorter than the body; mesoscutum evenly but very shallowly punctate and shining, inconspicuously so posteriorly; scutellum with the disk very slightly convex, practically impunctate and strongly shining, and the lateral face with the posterior polished area rather semicircular and not quite as large as the roughened part in front; mesopleura exceedingly highly polished; propodeum indistinctly punctate and very shining at extreme base, finely rugulose behind, with a rather distinct median longitudinal carina; stigma broad; radius perpendicular to the anterior margin of the wing and much longer than the transverse cubitus; nervellus curving strongly behind toward base of wing; posterior coxae with a large oval, punctate, flattened area on the outer edge at base above; spurs of posterior tibiae apparently equal in length, and hardly half as long as the metatarsus; abdomen elongate-oval; the first tergite broadening gradually toward apex, smooth and polished at base, punctate on the posterior half; second tergite trapezoidal, broader at apex than at base, the sides rather oblique on the basal half and parallel on the apical half, the plate somewhat smooth and shining medially, rugulose at the sides; third and following tergites smooth and shining; hypopygium not projecting beyond apex of last dorsal segment; ovipositor not exserted. Black; antennae entirely black; tegulae black; wings hyaline, the stigma dark brown; all coxae black; the remainder of the legs entirely testaceous; the narrow membranous margins along the sides of the two basal abdominal tergites fuscous; venter of the abdomen black.

Male.—Essentially as in the female, except that the second abdominal tergite is more smooth and shining.

Cocoons.—Small, dull white; gregarious, with practically no loose silk.

Type locality.—Falls Church, Virginia.

Type.—Cat. No. 22550, U.S.N.M.

Host.—(*Hydria*) *Calocalpe undulata* Linnaeus.

Described from three females and four males bred by Carl Heinrich in the Bureau of Entomology, under Hopkins U. S. No. 12136^{d}–1.

146. APANTELES GLOMERATUS (Linnaeus).

Ichneumon glomeratus LINNAEUS, Syst. nat., ed. 10, vol. 1, 1758, p. 568.

Microgaster glomeratus Linnaeus, HALIDAY, Entom, Magaz., vol. 2, 1834, p. 262.

Apanteles glomeratus Linnaeus, MARSHALL, Trans. Ent. Soc. London, 1885, p. 176.—SCUDDER, Butterflies U. S., 1889, p. 1204.—RILEY, in Scudder, Butterflies U. S., 1889, p. 1898.

Microgaster (*Apanteles?*) *pieridis* PACKARD, Proc. Boston Soc. Nat. Hist., vol 21, 1881, p. 26.

Microgaster congregatus, var. *pieridivora* RILEY, Amer. Natural., vol. 16, 1882, p. 679.

Habitat.—Europe; United States; Canada.

Hosts.—*Pieris rapae* Linnaeus; *P. protodice* Boisduval and LeConte; (?) *Autographa brassicae* Riley; *Pieris oleracea* Harris (Scudder).

Cocoons.—Bright to dull yellow; gregarious, loosely heaped together.

The National Collection possesses a large amount of material of this species, including the types of *pieridis*, and one series from England, received from G. H. Bignell. The greater part of this material has been reared from *Pieris rapae*, but one series bred at Riverhead, Long Island, by H. M. Russell is said to be from *Autographa brassicae;* another series, reared by W. E. Pennington at Boonsboro, Maryland, is said to have come from *Cirphis unipuncta*, while the Bureau of Entomology notes record the species as having been reared by T. H. Jones, at Baton Rouge, Louisiana, from *Pieris protodice*.

147. APANTELES ACRONYCTAE Riley.

Apanteles acronyctae RILEY, 2d. Rep. Insects Missouri, 1870, p. 120; Trans. Acad. Sci. St. Louis, vol. 4, pt. 2, 1881, p. 312.—VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, p. 195.

Apanteles orgyiae ASHMEAD, Bull. Ohio Exper. Sta., vol. 1, 1893, p. 157.

Habitat.—Illinois, Missouri, Iowa, Connecticut, New Hampshire, Colorado, California, Ohio, New Jersey.

Hosts.—*Acronycta populi* Riley (Riley); *A. oblinita* Smith and Abbot (Viereck); *Merolonche lupini* Grote; *Acronycta* (?) *leporina* Linnaeus; (?) *Hemerocampa leucostigma* Smith and Abbot.

Cocoons.—Gregarious, entirely inclosed in a mass of white loose silk.

A careful study of the types of *acronyctae* and *orgyiae* proves them to be identical.

Besides the type specimens of this species and those of its synonym, the National Collection contains several series of this species. One lot of specimens from Placer County, California, bears Bureau of Entomology No. 49° and is said to have been reared from *Merolonche lupini.* A series from Canobie Lake, New Hampshire is labeled as having been reared from *Acronycta* (?) *vulpina.* Another series bearing Bureau of Entomology No. 4345, was reared from a bombycid on willow, at West Cliffe, Colorado.

148. APANTELES FLAVIVENTRIS (Cresson).

Microgaster flaviventris CRESSON, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 66.

Apanteles flaviventris Cresson, ASHMEAD, Trans, Ent. Soc. London, 1900, p. 277.

Habitat.—West Indies; Texas.

Host.—*Tetralopha subcanalis* Walker.

Types in the Academy of Sciences at Philadelphia and not seen by the writer. However, the National Collection contains a series of what is without doubt this species, reared at Cuero, Texas, from *Tetralopha subcanalis* by M. M. High.

149. APANTELES HYPHANTRIAE Riley.

Apanteles hyphantriae RILEY, Rep. Entom. U. S. Dep. Agric., 1886, p. 513.—PACKARD, 5th Rep. U. S. Entom. Commiss., 1890, p. 254.—HOWARD, Bull. No. 5, U. S. Dept. Agric. Bur. Ent., tech. ser., 1897, p. 25.

Habitat.—British Columbia; Virginia; Maryland; Texas; Missouri; South Carolina; New Mexico; Connecticut; Massachusetts. Evidently this species is very widely distributed over the United States and Canada.

Hosts.—*Hyphantria cunea* Drury; *H. textor* Harris; *Hemerocampa leucostigma* Smith and Abbot (Howard).

Cocoons.—White; solitary.

Besides the types the National Collection contains specimens of this species reared from *Hyphantria cunea* at Vienna, Virginia, by R. A. Cushman; at College Park, Maryland, by A. B. Gahan; at Cuero, Texas, by M. M. High; and at Kirkwood, Missouri, by Miss M. E. Murtfeldt; also a series reared from *Hyphantria textor* at Holly Hill, South Carolina; two specimens bearing Bureau of Entomology No. 205–06; and several specimens from Mesilla, New Mexico, reared from an unidentified host.

150. APANTELES CLISIOCAMPAE Ashmead.

Apanteles clisiocampae ASHMEAD, in Fiske, Bull. No. 6, N. H. Agric. Exp. Sta., tech. ser., 1903, p. 229.

Habitat.—New Hampshire; New York.

Host.—*Malacosoma americana* Fabricius.

This species is very close to *hyphantriae*, but is probably distinct; separable by the characters noted in the key.

Represented in the United States National Museum by the type and a single specimen reared from *Malacosoma americana* at Auburn, New York, by B. A. Porter.

151. APANTELES EUPHYDRYIDIS, new species.

Female.—Length, 2.2 mm. Face closely coarsely punctate, very dull; vertex shagreened, somewhat shining; mesoscutum very closely coarsely punctate, rather dull; scutellum with the disk short and broad, convex, sparsely punctate, shining; the lateral face of scutellum with the polished area reduced to little more than a transverse line, the anterior sculptured area with strong rugae; mesopleura polished above and behind, and with a conspicuous longitudinal, indistinctly foveolate depression; propodeum very coarsely rugose; metacarpus distinctly longer than the stigma; the radius slightly longer than the transverse cubitus and uniting with it in a strong angle; posterior coxae smooth and shining; inner spur of posterior tibiae but very slightly longer than the outer and distinctly less than half as long as the metatarsus; abdomen slender, somewhat compressed toward apex; the first tergite but little broader at apex than at base, the sides bulging slightly, the tergite smooth and shining on the basal half, rugulose on the apical half; second tergite short and broad, the sides nearly parallel, the apical margin straight; medially the second tergite is somewhat smooth and shining; third and following tergites smooth and polished; hypopygium extending a little beyond the apex of the last dorsal segment; ovipositor slightly exserted. Mostly black; antennal scape testaceous, also the legs, including at least part of the posterior coxae; tegulae very dark testaceous; stigma and veins of forewing pale yellowish-brown; abdomen above, with the exception of the two basal tergites, which are black, largely testaceous; venter of abdomen practically entirely testaceous.

Male.—Essentially as in the female, except that the abdominal tergites beyond the second are somewhat black medially.

Type locality.—Plainfield, New Jersey.

Type.—Cat. No. 22551, United States National Museum.

Host.—*Euphydryas phaeton* Drury

Described from seven female and three male specimens bred under Bureau of Entomology No. 5852, July 22, 1893.

152. APANTELES SMERINTHI Riley.

Apanteles smerinthi RILEY, Trans. Acad. Sci. St. Louis, vol. 4, pt. 2, 1881, p. 311.

Habitat.—Missouri; New Hampshire; District of Columbia; New Jersey; Massachusetts; California, Canada. Evidently of very wide distribution.

Hosts.—*Smerinthus geminatus* Say; (*Smerinthus*) *Paonias excaecata* Smith and Abbot; *Smerinthus ophthalmicus* Boisduval.

Cocoons.—Gregarious, inclosed in a mass of tough silk, white in color.

This species is represented in the National Collection by the following material: The type series; a series from Canobie Lake, New Hampshire, reared from *Smerinthus geminatus;* a series from Washington, District of Columbia, reared from the same host; one specimen from Ottawa, reared by Dr. James Fletcher from *Paonias excaecata;* and several specimens from Los Angeles, California, reared from *Smerinthus ophthalmicus.*

153. APANTELES MURTFELDTAE Ashmead.

Apanteles murtfeldtae ASHMEAD, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 159.

Habitat.—Massachusetts; Missouri; Virginia.

Hosts.—Unidentified Geometridae.

Cocoons.—White, the surface rather uneven; gregarious, but formed separately and without loose silk.

Closely resembles *congregatus*, but differs in having the third abdominal tergite more or less granular on the basal two-thirds.

Besides the types there are in the National Collection 18 specimens reared by R. A. Cushman from a geometrid on rose at Falls Church, Virginia.

154. APANTELES GRENADENSIS Ashmead.

Apanteles grenadensis Ashmead, Trans. Ent. Soc. London, 1900, pt. 2, pp. 277, 278 (not *Urogaster grenadensis* Ashmead, same reference, p. 285).

Apanteles (*Protapanteles*) *harnedi* Viereck, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 580.

Apanteles harnedi Viereck, Vickery, Journ. Econ. Entom., vol. 8, 1915. p. 391.

Habitat.—West Indies; Mississippi; Texas; Tennessee; Missouri; Florida; widely distributed through the Southern States.

Hosts.—*Laphygma frugiperda* Smith and Abbot; *Plathypena scabra* Fabricius; *Cirphis unipuncta* Haworth; *Heliothis obsoleta* Fabricius; *Autographa*, species; *Laphygma exigua* Hübner; *Prodenia eridania* Cramer; *Cirphis latiuscula* Herrich-Schaeffer (Vickery); *C. multilinea* Walker (Vickery).

Cocoons.—Yellowish-white; solitary.

Besides the cotypes of *grenadensis* and the types of its synonym the National Collection possesses numerous series of this species. A large part of this material is recorded as reared from *Laphygma frugiperda* in various localities throughout the Southern States. The following rearings from other hosts are indicated, however, from *Plathypena scabra* by C. L. Scott, at Brownsville, Texas, under Webster No. 6412; from the same host at Nashville, Tennessee, by C. C. Hill, under Webster No. 11307, and at Charleston, Missouri, by E. H. Gibson; from *Cirphis unipuncta* by C. L. Scott, at Brownsville, Texas, under Webster No. 6453; from *Heliothis obsoleta* by R. A. Vickery, at Brownsville, Texas, under Webster No. 6437; from *Autographa*, species, by C. L. Scott, at Brownsville, Texas, under Webster No. 6411; from *Laphygma exigua* by R. A. Vickery, at Brownsville, Texas, under Webster No. 6476; from *Prodenia*, species, by R. A. Vickery, at Brownsville, Texas, under Webster No. 6481; and from *Prodenia eridania* by Max Kisliuk. at Allapata, Florida, under Hunter No. 9004.

155. APANTELES FISKEI (Viereck).

Apanteles (*Protapanteles*) *fiskei* Viereck, Proc. U. S. Nat. Mus., vol. 38, 1910, p. 379.

Habitat.—Massachusetts; Wisconsin; Montana.

Host.—*Olene*, species.

Cocoons.—Gregarious, entirely inclosed in a large mass of white silk.

In addition to the type series there are in the National Collection four specimens reared by R. A. Cooley in Montana from a tussock moth, and three specimens reared under Bureau of Entomology No. 4480° from *Olene*, species, in Wisconsin.

156. APANTELES OBSCURICORNIS (Viereck).

Apanteles (Protapanteles) obscuricornis VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Surv., 1916, pp. 186, 192.

Habitat.—Connecticut.

Host.—Unknown.

Type in the collection of the Connecticut Agricultural Experiment Station. No other specimens are known to the writer.

157. APANTELES MARGINIVENTRIS (Cresson).

Microgaster marginiventris CRESSON, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 67.

Apanteles marginiventris Cresson, ASHMEAD, Trans. Ent. Soc. London, 1900, p. 277.

Habitat.—West Indies.

Host.—Unknown.

The type material is in the Academy of Sciences at Philadelphia, and has not been examined by the writer.

158. APANTELES CHARADRAE, new species.

Female.—Length, 2.2 mm. Head indistinctly punctate, shining; antennae shorter than the body; mesoscutum shallowly but distinctly punctate; the disk of scutellum flat, with only a few weak punctures; mesopleura somewhat punctate anteriorly, smooth and shining posteriorly; propodeum entirely rugose and opaque, with a rather distinct median longitudinal carina; radius of forewing longer than the transverse cubitus; posterior coxae smooth and shining, with a conspicuous flattened area having a few punctures within on the outer face above; the posterior femora unusually stout; inner spur of posterior tibiae a little longer than the outer, also a little more than half as long as the metatarsus; abdomen not quite as long as the thorax; the first tergite with the sides rather strongly curved outwardly, the apex hardly broader than the base, the entire plate rugose; second tergite broad, subtrapezoidal, entirely roughened and opaque; remainder of the abdomen smooth and shining; ovipositor sheaths hardly exserted. Black; antennae brown; tegulae yellowish-testaceous; stigma and veins of forewing light brown; all coxae black; remainder of the legs entirely testaceous, except the extreme apex of the posterior femora above, which is slightly dusky; abdomen entirely black above and below.

Male.—Like the female except for the longer antennae.

Cocoons.—White; gregarious, and held together in a mass within the thin cocoon of the host.

Type locality.—Washington, District of Columbia.

Type.—Cat. No. 22552, U.S.N.M.

Host.—*Charadra deridens* Guenée.

Described from many specimens of both sexes bred under Bureau of Entomology No. 2603.

159. APANTELES FLAVICORNIS Riley.

Apanteles flavicornis RILEY, in Scudder, Butterflies U. S., 1889, p. 1905.

Habitat.—Missouri; Texas.

Host.—*Thanaos juvenalis* Fabricius (Riley); (?) geometrid.

Cocoons.—White; gregarious, held together in masses but not embedded.

Besides the types of this species, there are in the National Collection several specimens from Brownsville, Texas, labeled as having been reared from a geometrid larva.

160. APANTELES MAYAGUEZENSIS (Viereck).

Apanteles (*Protapanteles*) *mayaguezensis* VIERECK, Proc. U. S. Nat. Mus., vol. 44, 1913, p. 563.

Habitat.—Porto Rico.

Host.—Unknown.

Known only from the type series in the United States National Museum.

161. APANTELES AMERICANUS (Lepeletier).

Microgaster americanus LEPELETIER, Encycl. méthod. Insect., vol. 10, 1825, p. 41.

Apanteles americanus Lepeletier, ASHMEAD, Trans, Ent. Soc. London, 1900, p. 277.

Apanteles mexicanus ASHMEAD, Proc. Calif. Acad. Sciences, vol. 5, 1895, p. 545.

Habitat.—West Indies; Florida; Texas; Western Mexico.

Host.—Unknown, but probably large sphingid larvae.

Cocoons.—Pure white; gregarious, in enormous masses that are very beautiful.

There can be no doubt that *mexicanus* is identical with *americanus*.

In the National Collection are specimens of this species from Porto Rico reared by August Busck from a sphinx on "papaw"; also a large series from Paradise Key, Florida, reared by C. A. Mosier from a cluster of cocoons on "cabbage palmetto"; and several large series taken at Key West, Florida, by J. V. Harris. The writer has seen also specimens of a large series bred from several cocoon masses taken on tomato plants in Texas.

The location of the types of *americanus* is not certainly known, but they are probably in a European collection. The type series of the synonym is in the National Collection.

162. APANTELES SCHIZURAE Ashmead.

Apanteles schizurae ASHMEAD, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 162.

Habitat.—New Hampshire; Massachusetts; Connecticut; New York; Virginia; Illinois; Arkansas; Canada. Evidently very widely distributed over the United States and Canada.

Host.—Schizura unicornis Smith and Abbot; *Schizura*, species.

Cocoons.—Pale buff to dirty whitish; gregarious, and arranged parallel, side by side and closely cemented together; they are not inclosed in loose silk.

A large number of series of this species, including the types, are in the National Collection, and show a wide distribution. Several of these series are recorded from *Schizura unicornis*. No other hosts are definitely known, although one large series reared by R. A. Cushman at Falls Church, Virginia, is said to be from a Notodontid on oak; and two specimens from Bentonville, Arkansas, reared by D. Isely, are from *Schizura*, species.

163. APANTELES CONGREGATUS (Say).

Microgaster congregata SAY, Boston Journ. Nat. Hist., vol. 1, pt. 3, 1836, p. 262.

Microgaster utilis FRENCH, 6th Ann. Rep. South Illinois Normal Univ., 1880, p. 42; Can. Ent., vol. 12, 1880, p. 42.

Apanteles (*Protapanteles*) *congregatus* Say, VIERECK, Proc. U. S. Nat. Mus., vol. 44, 1913, p. 561.

Apanteles (*Protapanteles*) *augustus* VIERECK, Bull. 22, Conn. State Geol. and Nat. Hist. Surv., 1916, pp. 187, 194.

Habitat.—United States and Canada.

Hosts.—(*Phlegethontius*) *Protoparce quinquemaculata* Haworth; *P. sexta* Johannsen; *Dolba hylaeus* Drury; *Ceratomia catalpae* Boisduval; *Sphinx chersis* Hübner; *Ampeloeca myron* Cramer; *A. versicolor* Harris; *Sphinx kalmiae* Smith and Abbot; *Atreus plebeja* Fabricius; *Pholus pandorus* Huebner; *P. achemon* Drury; *Sphecodina abbotti* Swainson; evidently a very general parasite of *Sphingidae*, but has not been recorded from other families of Lepidoptera.

Cocoons.—White; gregarious, but formed separately on the back of the host caterpillar and not embedded in a mass of silk.

The type of *congregatus* no longer exists; but a neotype, which is in the United States National Museum, has been established by Viereck. Apparently *utilis* is a synonym, although it seems likely that French had specimens of two species before him while describing that species. In the opinion of the writer *augustus*, the type of which has been studied, is identical with *congregatus*.

The National Collection contains a vast amount of material of this well-known and widely distributed species. It is not deemed necessary to set forth here the recorded data for this material, since the host records, all of which are included in the above list, are the only matter of significance.

164. APANTELES HEMILEUCAE Riley.

Apanteles congregatus, var. *hemileucae* Riley, Trans, Acad. Sci. St. Louis, vol. 4, pt. 2, 1881, p. 309.

Apanteles (*Protapanteles*) *hemileucae* Viereck, Bull. 22, Conn. State Geol. and Nat. Hist. Survey, 1916, pp. 188, 195.

Habitat.—Missouri; New York; Massachusetts; probably generally distributed over the eastern part of the United States.

Hosts.—*Hemileuca maia* Drury; *Automeris io* Fabricius.

Cocoons.—As in *congregatus.*

Besides the types the National Collection contains a series of three specimens reared by E. P. Felt from *Hemileuca maia* at Karner, New York. Riley[1] recorded this species from *Automeris io.* Although *hemileucae* had not yet been described at this time, there can be no doubt that this species is meant.

SPECIES OF APANTELES UNKNOWN TO THE WRITER.

APANTELES CARPATUS (Provancher) (not Say).

Microgaster carpatus Provancher, Natural. Canad., vol. 12, 1881, p. 195.

Apanteles carpatus Provancher, Addit. faun. Canad. Hymenop., 1888, p. 388.

Apanteles ensiger Say=(*Apanteles carpatus* Provancher) Dalla Torre, Catalogus Hymenopterorum, vol. 4, 1898, p. 169.

According to a note by A. B. Gahan, made after an examination of the Provancher collection in the Museum of Public Instruction, at Quebec, the type of this species has been destroyed.

APANTELES NEPHOPTERICIS (Packard).

Microgaster nephoptericis Packard, Proc. Essex Instit., vol. 4, 1864, p. 122; Amer. Natural., vol. 2, 1868, p. 195.

Although this species was retained in the genus *Microgaster* by Dalla Torre, it appears from the description to be an *Apanteles.* It seems to be very close to *Apanteles ornigis* Weed.

SPECIES WRONGLY CLASSIFIED AS APANTELES.

The two following species, which were described in the genus *Apanteles*, and until the present retained in that genus, belong in *Microgaster.*

MICROGASTER XANTHASPIS (Ashmead).

Apanteles xanthaspis Ashmead, Trans. Ent Soc. London, 1900, p. 280.

A cotype of this species which is in the United States National Museum has been examined by the writer.

MICROGASTER RECURVARIAE (Ashmead).

Apanteles recurvariae Ashmead, Journ. N. Y. Ent. Soc., vol. 11, 1903, p. 144.

A study of the type of this species which is in the United States National Museum shows it to belong to the genus *Microgaster.* It is very near *Microgaster zonarius* and may, in fact, be that species.

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[1] Fifth Rep. Insects Missouri. 1873. p. 136.

HOSTS OF THE SPECIES OF APANTELES.

In the preparation of this list the catalogue of the Lepidoptera of North America, by Barnes and McDunnough, has been followed for the generic names and synonymy.

(?) *Acrobasis caryae* Grote	*Apanteles acrobasidis* Muesebeck; *cacocciae* Riley.
Acrocercops strigifinitella Clemens	*Apanteles rohweri* Muesebeck.
Acronycta brumosa Guenée	*Apanteles scitulus* Riley.
Acronycta hasta Guenée	*Apanteles lacteicolor* Viereck.
Acronycta (?) *leporina* Linnaeus	*Apanteles acronyctae* Riley.
Acronycta oblinita Smith and Abbott	*Apanteles acronyctae* Riley; *scitulus* Riley.
Acronycta populi Riley	*Apanteles acronyctae* Riley.
Agapema galbina Clemens	*Apanteles electrae* Viereck.
Aglais milberti Godart	*Apanteles atalantae* Packard.
Agrotis c-nigrum Linnaeus	*Apanteles xylinus* Say; *yakutatensis* Ashmead.
Alabama argillacea Hübner	*Apanteles aletiae* Riley.
Alsophila pometaria Harris	*Apanteles paleacritae* Riley.
Ampeloeca myron Cramer	*Apanteles congregatus* Say.
Ampeloeca versicolor Harris	*Apanteles congregatus* Say.
Anisota senatoria Smith and Abbot	*Apanteles anisotae* Muesebeck.
Anomis erosa Hübner	*Apanteles bedelliae* Viereck.
Anthocharis genutia Fabricius	*Apanteles flaviconchae* Riley.
Argynnis cybele Fabricius	*Apanteles argynnidis* Riley.
Argynnis, species	*Apanteles argynnidis* Riley.
(?) *Argynnis*, species	*Apanteles luteipennis* Muesebeck.
(?) *Argyresthia*, species on oak	*Apanteles betheli* Viereck.
Aristotelia fungivorella Clemens	*Apanteles aristoteliae* Viereck.
Atreus plebeja Fabricius	*Apanteles congregatus* Say.
Autographa brassicae Riley	*Apanteles autographae* Muesebeck; *laeviceps* Ashmead.
(?) *Autographa brassicae* Riley	*Apanteles glomeratus* Linnaeus.
Autographa gamma, var. *californica* Geyer	*Apanteles yakutatensis* Ashmead.
Autographa, species	*Apanteles grenadensis* Ashmead; *laeviceps* Ashmead.
(?) *Automeris io* Fabricius	*Apanteles hemileucae* Riley.
Basilarchia archippus Cramer	*Apanteles limenitidis* Riley.
Bedellia minor Busck	*Apanteles bedelliae* Viereck.
Bedellia somnulentella Zeller	*Apanteles bedelliae* Viereck.
Bucculatrix pomifoliella Clemens	*Apanteles cacocciae* Riley.
Bucculatrix on oak	*Apanteles bucculatricis* Muesebeck.
Cacoecia argyrospila Walker	*Apanteles gillettei* Baker.
Cacoecia rosaceana Harris	*Apanteles polychrosidis* Viereck.
Cacoecia semiferana Walker	*Apanteles cacocciae* Riley.
Calocalpe undulata Linnaeus	*Apanteles hydriae* Muesebeck.
Calpodes ares Felder	*Apanteles prenidis* Muesebeck.
Carpocapsa toreuta Grote	*Apanteles laspeyresiae* Viereck.
Ceratomia catalpae Boisduval	*Apenteles congregatus* Say.
Charadra deridens Guenée	*Apanteles charadrae* Muesebeck.
Chlorochlamys chloroleucaria Guenée	*Apanteles nemoriae* Ashmead.
Choreutis carduiella Kearfott	*Apanteles choreuti* Viereck.

Chorizagrotis agrestis Grote	*Apanteles laeviceps* Ashmead.
Chorizagrotis auxilaris Grote	*Apanteles laeviceps* Ashmead.
Chorizagrotis, species	*Apanteles alticola* Ashmead; *militaris* Walsh.
Cirphis latiuscula Herrich-Schaeffer	*Apanteles grenadensis* Ashmead.
Cirphis multilinea Walker	*Apanteles grenadensis* Ashmead.
Cirphis phragmatidicola Guenée	*Apanteles militaris* Walsh.
Cirphis unipuncta Haworth	*Apanteles flaviconchae* Riley; *forbesi* Viereck; *grenadensis* Ashmead; *laeviceps* Ashmead; *militaris* Walsh; *rufocoxalis* Riley.
Cosymbia lumenaria Huebner	*Apanteles paleacritae* Riley.
Crambus mutabilis Clemens	*Apanteles crambi* Weed.
Crambus trisectus Walker	*Apanteles crambi* Weed.
Crambus zeellus Fernald	*Apanteles crambi* Weed; *ensiger* Say.
Crambus, species	*Apanteles crambi* Weed.
Ctenucha brunnea Stretch	*Apanteles nigricornis* Muesebeck.
Desmia funeralis Hübner	*Apanteles canarsiae* Ashmead; *choreuti* Viereck.
Diacrisia virginica Fabricius	*Apanteles diacrisiae* Gahan; *scitulus* Riley.
Diatraea saccharalis Fabricius	*Apanteles diatraeae* Muesebeck.
Dolba hylaeus Drury	*Apanteles congregatus* Say.
Enarmonia saliciana Clemens	*Apanteles epinotiae* Viereck.
Ephestia kuehniella Zeller	*Apanteles ephestiae* Baker.
Epizeuxis lubricalis Geyer	*Apanteles pseudoglossae* Muesebeck.
Etiella schisticolor Zeller	*Apanteles etiellae* Viereck.
Euchaetias egle Drury	*Apanteles euchaetis* Ashmead.
Euphydryas editha Boisduval	*Apanteles koebelei* Riley.
Euphydryas phaeton Drury	*Apanteles euphydryidis* Muesebeck.
Eupithecia miserulata Grote	*Apanteles nemoriae* Ashmead.
Euproctis chrysorrhoea Linnaeus	*Apanteles lacteicolor* Viereck.
Eurema nicippe Cramer	*Apanteles cassianus* Riley.
Eurymus eurytheme Boisduval	*Apanteles cassianus* Riley; *laeviceps* Ashmead.
Eurymus philodice Godart	*Apanteles flaviconchae* Riley.
Everes comyntas Godart	*Apanteles theclae* Riley.
Evergestis rimosalis Guenée	*Apanteles orobenae* Forbes.
Feltia aeneipennis Grote	*Apanteles nitens* Muesebeck.
Feltia gladiaria Morrison	*Apanteles griffini* Viereck.
Feltia, species	*Apanteles feltiae* Viereck; *forbesi* Viereck.
Gelechia confusella Chambers	*Apanteles aristoteliae* Viereck.
Gelechia trialbamaculella Chambers	*Apanteles aristoteliae* Viereck.
Gelechia, species	*Apanteles aristoteliae* Viereck.
Gracilaria, species	*Apanteles polychrosidis* Viereck.
Haematopis grataria Fabricius	*Apanteles nemoriae* Ashmead.
Halisidota tesselaris Smith and Abbot	*Apanteles phobetri* Rohwer.
Harmologa fumiferana Clemens	*Apanteles fumiferanae* Viereck.
Heliothis obsoleta Fabricius	*Apanteles grenadensis* Ashmead; *militaris* Walsh.
Hemerocampa leucostigma Smith and Abbot	*Apanteles delicatus* Howard; *diacrisiae* Gahan; *hyphantriae* Riley.

(?) *Hemerocampa leucostigma* Smith and Abbot	*Apanteles acronyctae* Riley.
Hemileuca electra Wright	*Apanteles electrae* Viereck.
Hemileuca maia Drury	*Apanteles hemileucae* Riley.
Hemileuca nevadensis Stretch	*Apanteles electrae* Viereck.
Hyphantria cunea Drury	*Apanteles hyphantriae* Riley.
Hyphantria textor Harris	*Apanteles diacrisiae* Gahan; *hyphantriae* Riley; *lacteicolor* Viereck.
Hypoprepia, species	*Apanteles compressus* Muesebeck.
Ichthyura inclusa Hübner	*Apanteles sarrothripae* Weed.
Junonia coenia Hübner	*Apanteles junoniae* Riley.
Laphygma exigua Hübner	*Apanteles grenadensis* Ashmead; *laeviceps* Ashmead.
Laphygma frugiperda Smith and Abbot	*Apanteles grenadensis* Ashmead; *militaris* Walsh.
Lithocolletis mariaeella Chambers	*Apanteles ornigis* Weed.
Lithocolletis propinquinella Braun	*Apanteles ornigis* Weed.
Lithocolletis, species	*Apanteles ornigis* Weed.
Loxostege similalis Guenée	*Apanteles pyralidis* Muesebeck.
Lycaenopsis pseudargiolus Boisduval and LeConte	*Apanteles cyaniridis* Riley.
Malacosoma americana Fitch	*Apanteles clisiocampae* Ashmead.
(?) *Malacosoma americana* Fitch	*Apanteles rufocoxalis* Riley.
Megathymus yuccae Boisduval and LeConte	*Apanteles megathymi* Riley.
Merolonche lupini Grote	*Apanteles acronyctae* Riley.
Neleucania albilinea Huebner	*Apanteles laeviceps* Ashmead.
Nomophila noctuella Denis and Schiffermueller	*Apanteles pyralidis* Muesebeck.
Nyctobia anguilineata Grote and Robinson	*Apanteles palaeacritae* Riley.
Olene clintoni Grote	*Apanteles diacrisiae* Gahan.
(?) *Olene clintoni* Grote	*Apanteles scitulus* Riley.
Olene, species	*Apanteles fiskei* Viereck.
Ornix geminatella Packard	*Apanteles ornigis* Weed.
Paedisca, species	*Apanteles cacoeciae* Riley.
Paonias excaecata Smith and Abbot	*Apanteles smerinthi* Riley.
Papaipema maritima Bird	*Apanteles papaipemae* Muesebeck.
Papaipema nebris Guenée	*Apanteles papaipemae* Muesebeck.
Papilio oregonia Edwards	*Apanteles lunatus* Packard.
Papilio polyxenes Fabricius	*Apanteles lunatus* Packard.
Papilio zolicaon Boisduval	*Apanteles lunatus* Packard.
Paranthrene robiniae Hy. Edwards	*Apanteles paranthrenidis* Muesebeck.
Parasa chloris Herrich-Schaeffer	*Apanteles empretiae* Viereck.
Parastichtis bicolorago Guenée	*Apanteles parastichtidis* Muesebeck.
Peronea permutana Duponchel	*Apanteles sarrothripae* Weed.
Phigalia titea Cramer	*Apanteles phigaliae* Muesebeck.
Phobetron pithecium Smith and Abbot	*Apanteles phobetri* Rohwer.
Pholisora catullus Fabricius	*Apanteles pholisorae* Riley.
Pholus achemon Drury	*Apanteles congregatus* Say.
Pholus pandorus Hübner	*Apanteles congregatus* Say.
Phthorimaea glochinella Zeller	*Apanteles phthorimaeae* Muesebeck.
Phthorimaea operculella Zeller	*Apanteles scutellaris* Muesebeck.
Pieris oleracea Harris	*Apanteles glomeratus* Linnaeus.

Pieris protodice Boisduval and LeConte	*Apanteles glomeratus* Linnaeus.
Pieris rapae Linnaeus	*Apanteles glomeratus* Linnaeus.
Plathypena scabra Fabricius	*Apanteles flaviconchae* Riley; *grenadensis* Ashmead; *plathypenae* Muesebeck.
Pleuroprucha insulsaria Guenée	*Apanteles nemoriae* Ashmead.
Polia renigera Stephens	*Apanteles forbesi* Viereck.
Polia stricta Walker	*Apanteles forbesi* Viereck.
Polychrosis liriodendrana Kearfott	*Apanteles polychrosidis* Viereck.
Polychrosis viteana Clemens	*Apanteles polychrosidis* Viereck.
Porthetria dispar Linnaeus	*Apanteles lacteicolor* Viereck; *melanoscelus* Ratzeburg.
Prodenia eridania Cramer	*Apanteles grenadenis* Ashmead.
Proleucoptera albella Chambers	*Apanteles bedelliae* Viereck.
Protoparce quinquemaculata Haworth	*Apanteles congregatus* Say.
Protoparce sexta Johanssen	*Apanteles congregatus* Say.
Pseudohazia eglanterina Boisduval	*Apanteles electrae* Viereck.
Pseudohazia hera Harris	*Apanteles electrae* Viereck.
Psorosina hammondi Riley	*Apanteles canarsiae* Ashmead; *etiellae* Viereck.
Pyrausta farinalis Linnaeus	*Apanteles carpatus* Say.
Pyrausta futilalis Lederer	*Apanteles podunkorum* Viereck; *pyralidis* Muesebeck; *pyraustae*, Viereck.
Pyrausta penitalis Grote	*Apanteles harti* Viereck.
Recurvaria milleri Busck	*Apanteles californicus* Muesebeck.
Recurvaria robiniella Fitch	*Apanteles robinae* Fitch.
Recurvaria thujaeella Kearfott	*Apanteles bedelliae* Viereck.
Sarrothripa reveyana Scopoli	*Apanteles sarrothripae* Weed.
Schizura unicornis Smith and Abbot	*Apanteles schizurae* Ashmead.
Schizura, species	*Apanteles schizurae* Ashmead.
Scolecocampa liburna Geyer	*Apanteles politus* Riley.
Scotogramma, species	*Apanteles laeviceps* Ashmead.
Sibine stimulea Clemens	*Apanteles empretiae* Viereck.
Smerinthus geminatus Say	*Apanteles smerinthi* Riley.
Smerinthus ophthalmicus Boisduval	*Apanteles smerinthi* Riley.
Sphecodina abbotti Swainson	*Apanteles congregatus* Say.
Sphinx cheris Hübner	*Apanteles congregatus* Say.
Sphinx kalmiae Smith and Abbot	*Apanteles congregatus* Say.
Stagmatophora gleditschiacella Chambers	*Apanteles stagmotophorae* Gahan.
Strymon melinus Hübner	*Apanteles theclae* Riley.
Synanthedon scitulus Harris	*Apanteles sesiae* Viereck.
Tetralopha subcanalis Walker	*Apanteles flaviventris* Cresson.
Thanaos juvenalis Fabricius	*Apanteles flavicornis* Riley.
Thecla, species	*Apanteles theclae* Riley.
Tinea pellionella Linnaeus	*Apanteles carpatus* Say.
Tischeria malifoliella Clemens	*Apanteles tischeriae* Viereck.
Tischeria, species	*Apanteles ornigis* Weed.
Tmetocera ocellana Schiffermueller	*Apanteles tmetocerae* Muesebeck.
Tortrix, species	*Apanteles cacoeciae* Riley.
Trichophaga tapetiella Linnaeus	*Apanteles carpatus* Say.
Vanessa atalanta Linnaeus	*Apanteles atalantae* Packard; *edwardsii* Riley.
Vanessa cardui Linnaeus	*Apanteles carduicola* Packard.
Vanessa virginiensis Drury	*Apanteles carduicola* Packard.

SPECIES INDEX.

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OBSERVATIONS ON THE NEMATODE GENUS NEMATODIRUS, WITH DESCRIPTIONS OF NEW SPECIES.

By HENRY G. MAY,[1]

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INTRODUCTION.

There has been in the past some confusion in regard to the identity of the species of *Nematodirus*. In 1896 Railliet described *Strongylus spathiger* from the camel and distinguished it from *Strongylus filicollis* (Rudolphi, 1802) from the sheep. Ransom in 1907 proposed the genus *Nematodirus*, with *Strongylus filicollis* Rudolphi as type, and in 1911 assigned forms found in the United States in sheep to the species *N. filicollis*. His figures of the bursa and spicules of the male agree with the description of *N. spathiger*, but the female and egg measurements do not agree. In 1912 Railliet and Henry published the following table to distinguish the species of *Nematodirus* and expressed the opinion that the American form described by Ransom as *N. filicollis* is *N. spathiger*. Later authors have been inclined to agree with them.

Table of Railliet and Henry.

	N. filicollis.	*N. spathiger.*	*N. roscidus.*
Male:			
Length of body	8–15 mm	14–19 mm	9–14 mm.
Spicules—			
Length	750–900 μ	1,000–1,200 μ	900–925 μ.
Terminal membrane.	Narrow, lanceolate.	Spatulate	Narrow, lanceolate.
Caudal bursa:			
Middle rays	Scarcely separated.	Scarcely separated.	Well separated.
Salient lobule at the level of each posterior ray.	Absent	Present	Absent.
Female:			
Length of body	12–20 mm	18–29 mm	12–18 mm.
Eggs—			
Shell	Smooth	Smooth, slightly thickened at the poles.	Alveolate.
Dimensions	145–180 μ by 75–90 μ.	200–260 μ by 100–110 μ.	160–226 μ by 80–90 μ.

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[1] Resigned September 2, 1919.

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In order, if possible, to clear up the existing doubt, Dr. B. H. Ransom suggested that I make a study of the *Nematodirus* material available in the Helminthological Collections of the United States National Museum. The results indicate that there exist no such clear differences between *N. spathiger* and *N. filicollis* as indicated by Railliet, and furthermore four other forms, not previously described, were found to be present.

MATERIAL AND METHODS.

In addition to the abundant material collected in the United States there were available for study specimens of both *N. spathiger* and *N. filicollis* received from Railliet, and mounted specimens of *Nematodirus* collected by O. Schnyder from cattle in Switzerland. The material collected by Railliet from a dromedary at Alfort, France, identified by him as *Strongylus spathiger*, and submitted to the Bureau of Animal Industry in 1896 (U.S.N.M. Helminthological Collections, No. 2760), contains three males and a number of females of *N. spathiger*, and four males and three females of a new species resembling *N. mauritanicus*, described by Maupas and Seurat (1912), also from a dromedary. The material collected by Railliet from *Ovis aries* in France (U.S.N.M. Helminthological Collections, No. 4027) and identified by him as *Strongylus filicollis* contains three males of *N. filicollis*, one male of *N. spathiger*, and several females which may be either. The specimens from Schnyder (U.S.N.M. Helminthological Collections, Nos. 15728 and 15739) are different from any others examined. The American material contains both *N. spathiger* and *N. filicollis*, with two additional forms not found elsewhere.

For the study of the spicules the material was cleared in phenol alcohol, while for the study of other characters specimens were either cleared in glycerol or stained and mounted in balsam. Sections were used to clear up certain points and to check up others. The spicules of nearly 800 specimens were measured. Measurements were made of the length and breadth of 350 eggs.

Genus NEMATODIRUS Ransom, 1907.

1907. *Nematodirus* Ransom, 1907*k*, p. 4.

Generic diagnosis.—Metastrongylinae: Filiform, with reproductive organs in posterior body region. Anterior part of female and entire length of male marked with longitudinal cuticular ridges depending in number on the diameter of the specimen—usually 18 to 24. Cuticula inflated in head and neck region, and in the female sometimes also between anus and posterior end. Coarse, transverse striations within the inflated area, but not elsewhere. Mouth opening oval and surrounded by six inconspicuous papillae, the two lateral papillae being largest. Buccal cavity very short. Esophagus 400 to 700 μ long, evertable in the anterior region, and armed with a larger dorsal and two smaller latero-ventral teeth. Nerve ring near middle of esophagus. Cervical papillae minute or absent. Excretory pore large, opening on ventral side near base of esophagus and connected with two unicellular glands closely associated with the lateral lines and occupying the anterior fifth of the body. Bursa nearly terminal, with two large lateral, symmetrical lobes and two small dorsal lobes, each closely associated with a lateral lobe. No unpaired median dorsal lobe. Ventral rays of bursa slender, close together, parallel. Externo-lateral ray proximally close to medio-lateral ray, but distally curved ventrad, away from the latter. Medio-lateral and postero-lateral rays close together, diverging slightly at the tip and curving slightly dorsad. Lateral rays much thicker than others. Externo-dorsal ray very slender. Dorsal ray (one in each dorsal lobe) short, bifid at the tip, with the external branch curved toward externo-dorsal ray. Spicules slender, tubular, united by a membrane throughout part of their length. Prebursal papillae small, inconspicuous.

Females larger than males. Vulva a transverse slit located in or near the middle third of the body. Eggs large, oval. Posterior end of female truncate, provided with a short, slender, acutely pointed process.

Type species.—Nematodirus filicollis (Rudolphi, 1802) Ransom, 1907.

The genus *Mecistocirrus* Railliet and Henry, 1912, with *M. digitatus* (von Linstow, 1906) Railliet and Henry, 1912, as type species, is very closely related to *Nematodirus*. In it the vulva of the female is located near the anus.

KEY TO SPECIES OF NEMATODIRUS.

1(12). Spicules less than 2 mm. long ---------- 2.
2(3). Spicules not united at tip ---------- *furcatus.*
3(2). Spicules united at tip ---------- 4.
4(7). Dorsal lobes of bursa not distinctly set off from lateral lobes; spicules with sharp point ---------- 5.
5(6). Medio-lateral and postero-lateral rays of bursa scarcely separated; eggs with smooth shells ---------- *filicollis.*
6(5). Medio-lateral and postero-lateral rays of bursa well separated; eggs with alveolate shells ---------- *roscidus.*
7(4). Dorsal lobes of bursa more or less distinctly set off from lateral lobes; spicules with sharp or blunt point ---------- 8.
8(9). Spicule point blunt or spatulate ---------- *spathiger.*
9(8). Spicule point sharp ---------- 10.
10(11). Spicules of equal length, straight at tip, with no tendency toward twisting ---------- *helvetianus.*
11(10). Spicules slightly unequal in length, twisted near the tip ---------- *abnormalis.*
12 (1). Spicules more than 2 mm. long ---------- 13.
13(14). Vulva in anterior half of body ---------- *dromedarii.*
14(13). Vulva in posterior half of body ---------- 15.
15(16). Eggs large, 250 by 110 μ; spicules 5 mm. long ---------- *mauritanicus.*
16(15). Eggs smaller, 175 by 85 μ; spicules 3 mm. long ---------- *neotoma.*

DESCRIPTIONS OF SPECIES.

NEMATODIRUS FILICOLLIS (Rudolphi, 1802) Ransom, 1907.

Plate 31, fig. 18; plate 33, fig. 24.

1802. *Ascaris filicollis* Rudolphi, 1802*a*, pp. 23–25, pl. 1, fig. 1, *a*, *b*, *c* (from *Ovis aries;* Germany).

1803. *Strongylus filicollis* (Rudolphi, 1802) Rudolphi, 1803*a*, pp. 17–18.

1803. *Fusaria filicollis* (Rudolphi) Zeder, 1803*a*, p. 110 (*Ascaris filicollis* Rudolphi, 1802, renamed).

1907. *Nematodirus filicollis* (Rudolphi) Ransom, 1907*k*, p. 4.

Specific diagnosis.—Nematodirus: Species small. Male, 10 to 15 mm. long and 125 to 150 μ in maximum diameter. Bursa relatively large with thin rays. Dorsal lobes of bursa not set off from lateral lobes. Bosses large and elongated. Spicules 0.68 to 0.95 mm. long, provided with sharply pointed terminal piece. Esophagus 0.4 to 0.6 mm. long, somewhat longer in the female than in the male. Female 15 to 20 mm. long. Vulva located between anterior two-thirds and posterior one-third of body. Anus 70 to 80 μ from truncated posterior end. Eggs 130 to 200 μ by 70 to 90 μ, with smooth shell of nearly uniform thickness.

Habitat.—Small intestine of sheep, cattle, goats, and deer.

Distribution.—Europe and America.

NEMATODIRUS ROSCIDUS Railliet, 1911.

1911. *Nematodirus roscidus* Railliet, 1911, in Brumpt, 1911, pp. 907, 908 (in stag ("cerf"); France).

Specific diagnosis.—Nematodirus: Species small. Male, 9 to 14 mm. long. Spicules, 0.90 to 0.925 mm. long, with slender lanceolate terminal membrane. Medio-lateral and postero-lateral rays of bursa well separated. Dorsal lobes not salient. Female, 12 to 18 mm. long. Eggs, 160 to 226 μ by 80 to 90 μ; surface of eggshell alveolate. (Foregoing description taken from Railliet and Henry, 1912.)

Habitat.—Intestine of stag.

Distribution.—France.

NEMATODIRUS SPATHIGER (Railliet, 1896) Railliet and Henry, 1909.

Plate 29, figs. 2–14; plate 30, figs. 15–17; plate 32, fig. 21; plate 33, fig. 25; plate 34, fig. 26.

1896. *Strongylus spathiger* Railliet, 1896*m*, p. 490 (in *Camelus dromedarius;* France).

1909. *Nematodirus spathiger* (Railliet) Railliet and Henry, 1909*a*, p. 87.

Specific diagnosis.—Nematodirus: Medium-sized species. Male. 10 to 15 mm. long and 125 to 175 μ in maximum diameter. Bursa relatively small. Dorsal lobes set off by indentations from lateral lobes. Bosses few and small. Spicules, 0.70 to 1.10 mm. long, provided with spoon-shaped terminal piece. Esophagus as in *N. filicollis.* Female, 15 to 23 mm. long. Vulva and anus located as in *N. filicollis.* Eggs, 150 to 220 μ by 80 to 110 μ, with smooth shells of nearly uniform thickness.

Habitat.—Small intestine of sheep, cattle, goats, deer, camels, and rodents.

Distribution.—Almost cosmopolitan.

NEMATODIRUS ABNORMALIS, new species.

Plate 32, fig. 23; plate 34, fig. 29.

Specific diagnosis.—Nematodirus: Species considerably larger than *N. filicollis.* Male, 11 to 17 mm. long and 150 to 200 μ in greatest diameter. Bursa relatively small, with heavy rays. Dorsal lobes set off from lateral lobes by deep indentations. Externo-dorsal ray nearer edge of bursal membrane throughout median third than at its distal end. Bosses numerous, small. Spicules, 0.90 to 1.25 mm. long, provided with an asymmetrical, pointed terminal piece. Asymmetry is due to the fact that one spicule is slightly shorter than the other, and the two are twisted at the end. Length of esophagus as in *N. filicollis.* Female, 18 to 25 mm. long. Location of vulva and anus as in *N. filicollis.* Eggs, 160 to 230 μ by 85 to 115 μ, with smooth shell of nearly uniform thickness.

Habitat.—Small intestine of sheep and goats.

Distribution.—America.

Type specimens.—U.S.N.M. Helminthological Collections, No. 19303, collected from a maltese goat by E. C. Stevenson at Bethesda, Maryland, August 14, 1906.

NEMATODIRUS HELVETIANUS, new species.

Plate 31, fig. 20; plate 35, fig. 30.

Specific diagnosis.—Nematodirus: Species much like *N. abnormalis.* Rays of bursa not so heavy; dorsal rays less distinctly set off; externo-dorsal ray nearest the edge of the membrane at its distal end. Bosses few and large. Spicules, 0.90 to 1.25 mm. long, provided with a sharp, symmetrical terminal piece, much as in *N. filicollis.* Female and eggs as in *N. abnormalis.*

Habitat.—Small intestine of cattle.

Distribution.—Switzerland.

Type specimens.—U.S.N.M. Helminthological Collections, No. 15728, collected from the small intestine of an ox by O. Schnyder in Switzerland, October 17, 1905.

NEMATODIRUS FURCATUS, new species.

Plate 29, fig. 1; plate 31, fig. 19; plate 34, figs. 27–28.

Specific diagnosis.—Nematodirus: Species very small. Male, 6 to 6.4 mm. long and 65 to 70 μ in greatest diameter. Bursa resembles that of *N. filicollis*, with rays relatively thinner and longer. Bosses smaller. Spicules, 0.50 to 0.80 mm. long, separated throughout the distal third or more, each one ending as a beveled tube. Length of esophagus, 0.30 to 0.45 mm. Diameter of head without inflated cuticula, 17 to 23 μ; with inflated cuticula, up to 45 μ. Three males only available for study.

Habitat.—Small intestine of sheep.

Distribution.—Michigan.

Type specimens.—U.S.N.M. Helminthological Collections, No. 18988, collected from the small intestine of a sheep by W. L. Chandler at East Lansing, Michigan, 1919.

NEMATODIRUS NEOTOMA Hall, 1916.

1912. *Nematodirus* species HALL, 1912, p. 351.

1916. *Nematodirus neotoma* HALL, 1916, pp. 136–138, figs. 172–180 (type specimens, U.S.N.M.Helm.Coll., No. 16134, from *Neotoma cinerea rupicola*, Colorado).

Specific diagnosis.—Nematodirus: Medium-sized species. Male, 8 to 11 mm. long, with a maximum diameter of 135 μ. Bursa with stout rays. Dorsal lobes set off by wide notch from lateral lobes and united with each other by a membrane showing only a shallow median indentation. Bosses numerous and very small. Bursal membrane marked with indistinct striations. Spicules, 3 to 3.4 mm. long, ending in a blunt point not provided with a distinct terminal piece. Esophagus, 335 to 500 μ long. Female, 18 to 22 mm. long, with position of vulva as in *N. filicollis*. Anus about 120 μ from posterior end. Ovijectors longer and less muscular than in *N filicollis*. Eggs 145 to 190 μ by 80 to 90 μ.

Habitat.—Small intestine and stomach of rodents of the genus *Neotoma*.

Distribution.—Colorado.

NEMATODIRUS MAURITANICUS Maupas and Seurat, 1912.

1912. *Nematodirus mauritanicus* MAUPAS and SEURAT, 1912, pp. 628–632, figs. 1–10 (from small intestine of dromedary, Ghardaïa, North Africa).

Specific diagnosis.—Nematodirus: Species large. Male, 13 to 15 mm. long, with maximum diameter of 167 to 170 μ. Dorsal lobes of bursa set off from lateral lobes by deep indentations and united with each other as in *N. neotoma*. Spicules, 4.5 to 5.5 mm. long, provided with a sharply pointed terminal piece in the shape of a parallelogram. Length of esophagus, 575 to 610 μ. Female, 21 to 24 mm. long, with vulva between middle and posterior third of body, and anus 105 μ from posterior truncated end. Ovijectors very long, unequal, being, respectively, 3.2 and 1.4 mm. long, and both passing backward in body. Eggs, 220 to 280 μ by 110 to 115 μ.

Habitat.—Small intestine of dromedary.

Distribution.—Africa.

NEMATODIRUS DROMEDARII, new species.

Plate 32, fig. 22; plate 35, fig. 31.

Specific diagnosis.—Nematodirus: Species large. Male, 10 to 15 mm. long and 200 to 250 μ in maximum diameter. Bursa resembles that of *N. helvetianus.* Bosses few, containing granular substance. Striations on bursa present. Spicules, 5 to 5.36 mm. long, provided with a sharp terminal piece, as in *N. filicollis.* Esophagus, 500 to 600 μ long, slightly longer in the female than in the male. Diameter of head, 50 to 55 μ. Female, 20 to 29 mm. long, with vulva one-third of the body length from the anterior end, and anus 145 to 150 μ from the truncated posterior end. Ovijectors very long, as in *N. mauritanicus.* Maximum diameter of female 450 to 500 μ. Eggs 230 to 260 μ by 100 to 120 μ, with smooth shells of nearly uniform thickness.

Habitat.—Small intestine of dromedary.

Distribution.—France.

Type specimens.—U.S.N.M. Helminthological Collections, No. 19303, collected from a dromedary by A. Railliet in France. (Separated from No. 2760, *N. spathiger.*)

REMARKS ON MORPHOLOGY.

In an attempt to find specific differences among members of the genus *Nematodirus* besides those of the bursa and spicules of the males, various details of morphology were studied in the specimens available. In the case of the short-spiculed forms (*N. filicollis*, *N. spathiger*, *N. abnormalis*, and *N. helvetianus*), however, it was impossible to find characters whereby the females could be distinguished.

HEAD AND NECK REGION.

The cuticula of the portion of the body over the region occupied by the anterior one-third of the esophagus is frequently inflated (plate 29, figs. 1, 2). This inflation is variable within the same species, but seems to occur in all of them. The inflated portion of the cuticula is marked by superficial coarse rings, and, in stained specimens, by deeper, stainable rings. The mouth is an oval terminal opening in the cuticula covering the head, leading into a very short buccal cavity, usually not more than 5 μ in length. Surrounding the mouth opening are six circumoral papillae. The two lateral papillae are comparatively large and are easily visible in toto mounts. The ventral and dorsal pairs are much smaller and are visible in toto preparations only in favorable mounts (plate 29, fig. 7). Anteriorly the muscular esophagus ends abruptly in the buccal cavity. In end view the two latero-ventral and the dorsal muscular fields of the esophagus surround a triradiate lumen. The dorsal field is provided near its anterior end with a tooth equal to about half the diameter of the esophagus (plate 29, fig. 8). The tooth probably contains the outlet of a gland, indicated by a large nucleus at its base. The two ventral fields are each provided with a smaller tooth. The whole anterior end of the esophagus is evertable through the mouth, and when it is everted the teeth may be seen to point forward and outward (plate 29, figs. 2–4). The nerve ring is large and usually located near the middle of the esophagus (plate 29, fig. 9).

BODY.

The number of longitudinal cuticular ridges, usually stated to be 18 to 22, or even 26, was found to depend on the diameter of the body (plate 29, figs. 9–14; plate 30, fig. 15.) The ridges occupy two fields, dorsal and ventral, arising at the anterior end as two single median ridges. The ventral median ridge is interrupted by the opening of the excretory pore. The other ridges arise on both sides of the median ridges as the body increases in diameter. The median ridges always remain highest and the lateral ones lowest. The median ridges arise directly over the dorsal and ventral hypodermal thickenings, but there are no ridges corresponding to the lateral thickenings of the hypodermis. Alternating with the four lateral, dorsal, and ventral lines, or hypodermal thickenings are four muscular tracts. Each tract at the nerve ring contains two muscle cells, but later contains four or more.

The vulva was found to be a transverse slit in all of the species examined. The ovijectors in the species with short spicules are very short and stout, as described in detail by Maupas and Seurat (1912), while in the forms with long spicules they are much elongated.

EXCRETORY APPARATUS.

The excretory apparatus deserves special mention on account of its great development (plate 29, figs. 10–14.) The excretory pore is large, being easily visible in toto preparations, located at the base of the esophagus and opening through the median ventral ridge, as already stated. The excretory tube branches almost immediately, each branch passing diagonally back to its corresponding lateral field. There soon arises in connection with each of these fields a vascular thickening, which increases in diameter posteriad and becomes more or less dissociated from the lateral field to form a pyriform renette or cervical gland with one huge nucleus at its middle. The two renette cells occupy about one-fifth of the body length, one extending slightly farther back than the other. Throughout their extent the excretory tubes can not be traced, but behind them the tubes again appear in the lateral fields. The structure of the apparatus is particularly interesting as throwing some light on the possible relation between the excretory apparatuses of parasitic and free-living nematodes.

POSTERIOR END.

The bursa of the male as found in *N. furcatus* and *N. filicollis* differs from the others mainly in the relatively greater development of the membrane as compared with that of the rays. The membrane then forms a broader margin around the rays and fills out completely the space between the externo-dorsal and dorsal rays. The minimal development of the membrane is found in *N. abnormalis*, where it little more than covers the rays, and the indentation between the externo-dorsal and dorsal rays is so deep that the externo-dorsal ray lies very close to the edge of the membrane. The size and extent of the membrane connecting the two dorsal lobes is variable, and reaches its greatest development in *N. neotoma*, where it fills out almost the entire space between the two dorsal rays, giving the appearance of an unpaired dorsal median lobe, except for the presence of a deep median notch (plate 31, figs. 18–20; plate 32, figs. 21–23).

On the inside of each lateral lobe of the bursa are a number of blisterlike, transparent elevations or bosses, already described by Hall as transparent maculae. In *N. neotoma* Hall describes them as located "around the proximal part of the lateral ray and in the area between the externo-lateral and other lateral rays." In the species from ruminants there seems to be a fundamental arrangement into two groups, either one of which may be more or less developed or even absent in a given species. One group or field extends along the edge of the membrane, slightly farther in than the ends of the rays, from the ventral rays to the postero-lateral ray. The other group has the shape of an open V, and is placed so that it forms a triangle with the first group.

The anal glands of the female were found to show no specific differences. There are in general three groups of anal gland cells and one of caudal cells, but they are variable in size and position. The anal cells are arranged as two latero-ventral groups and one median dorsal group. The caudal cells are located directly behind the dorsal anal cells, and are connected with a ventral thickening of the caudal hypoderm behind the anus (plate 30, figs. 16, 17).

DISCUSSION.

The species here described fall into three distinct groups—the *filicollis* group, the *mauritanicus* group, and the *neotoma* group. *Nematodirus neotoma* has characters that place it rather close to the genus *Mecistocirrus;* long spicules, smaller eggs and the vulva set well back.

Nematodirus mauritanicus and *N. dromedarii* differ from each other chiefly in the fact that in *N. mauritanicus* the vulva is located in the posterior body region, while in *N. dromedarii* it is in the anterior region. Although these forms have long spicules the other characters seem to show that they are not so close to *Mecistocirrus* as is *N. neotoma.* However, all forms with long spicules seem to be closely related and the establishment of the genus *Mecistocirrus* to contain some of them merely because in these forms the vulva is located within a few millimeters of the anus instead of farther forward as in the others does not seem to be at all justified. On the same ground one would have to make a new genus for *N. dromedarii*, and possibly also for *N. mauritanicus*, for in both of these forms the bulk of the reproductive organs in the female lies well back behind the vulva, both ovijectors even being placed behind the vulva instead of one on either side, as in the *filicollis* group and in *N. neotoma.* The position of the vulva seems to be the most variable character in the females of this group, and can hardly be regarded as any more than of specific value. The only other recorded character distinctive of the genus *Mecistocirrus* is the presence of cervical papillae; but minute papillae are also described for *N. mauritanicus.* In the variation in the position of the vulva and in the disposition of the female reproductive organs this group seems to be unique among the parasitic nematodes. Seurat in 1918 divided parasitic nematodes into three groups: Amphidelphs, in which the vulva is located somewhere near the middle of the body and the ovijectors are placed one in front and the other behind; Opisthodelphs, in which the vulva is anterior and the ovijectors are both behind; and Prodelphs, in which the vulva is near the anus with the ovijectors anteriad. He attached very deep phylogenetic significance to these three types. Here, however, all three are found in a single group of evidently very closely related forms.

The *filicollis* group contains the species *N. furcatus*, *N. filicollis*, *N. helvetianus*, and *N. abnormalis* in a series of possible relationships; with *N. spathiger* as a branch coming off somewhere between *N. filicollis* and *N. helvetianus.*

Some of the confusion among species in the genus is apparently due to the fact that Railliet's description of *N. spathiger* is evidently based in part on females of *N. dromedarii.* His measurements of females and eggs, consequently, were much too large for *N. spathiger.* He also described thickenings of the eggshells at the ends which, however, I have not observed in the specimens that I have examined.

As no specimens of *N. roscidus* were available for study, and as the published descriptions of this species are brief and unaccompanied by illustrations, I am unable to suggest its relationship to other species of the genus.

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EXPLANATION OF PLATES.

Plate 29.

Figs. 1–14. 1. Nematodirus furcatus. Anterior end showing inflated cuticula, dorsal tooth and some circumoral papillae. 2. N. spathiger. Anterior end showing inflated cuticula and everted esophagus with dorsal tooth. 3. N. spathiger. Ventral view of anterior end with esophagus partly everted, showing dorsal and latero-ventral teeth. 4. Same as fig. 3, lateral view. 5. Lateral view of anterior end with esophagus not everted. Specimen partly crushed. 6. N. spathiger. Junction of esophagus and intestine and opening of excretory pore, side view. 7. N. spathiger. First section from anterior end, showing the oral opening, triradiate lumen of esophagus, and circumoral papillae. 8. Section a little farther back, showing dorsal tooth with large nucleus at base. 9. Section through nerve ring. 10. Section through excretory pore. 11. Section through excretory bridge. 12. Section a short distance behind excretory bridge. 13. Section through nucleus of one of renette cells. 14. Section showing disappearance of renette cells. Lettering: *c. r.*, cuticular ridges; *d. f.*, dorsal field; *e.*, esophagus; *e. c.*, excretory canal; *e. p.*, excretory pore; *i.*, intestine; *l. f.*, lateral field; *m. c.*, muscle cells; *n. r.*, nerve ring; *r. c.*, renette cells; *t.*, testis; *v. f.*, ventral field.

Plate 30.

Figs. 15–17. 15. Nematodirus spathiger. Section through body of female, about one-third of the way back. 16. Posterior end of female, ventral view. Drawn as transparent object. 17. Lateral view of same. Lettering same as under previous figures, and *a.*, anus; *c. g.*, caudal gland; *c. p.*, caudal process; *d. g.*, dorsal gland; *l. g.*, latero-ventral gland; *o.*, ovary; *t. m.*, transverse muscles.

Plate 31.

Figs. 18–20. 18. Nematodirus filicollis. Side view of bursa, spread out. 19. N. furcatus. Side view of bursa, spread out. 20. N. helvetianus. Side view of bursa, spread out. Lettering same as under previous figures, and *b.*, bosses; *d.*, dorsal ray; *e. d.*, externo-dorsal ray; *e. l.*, externo-lateral ray; *l. v.*, latero-ventral ray; *m. l.*, medio-lateral ray; *p. l.*, postero-lateral ray; *v. v.*, ventro-ventral ray.

Plate 32.

Figs. 21–23. 21. Nematodirus spathiger. Side view of bursa, spread out. 22. N. dromedarii. Side view of bursa, spread out. 23. N. abnormalis. Side view of bursa, spread out. Lettering same as under previous figures.

Plate 33.

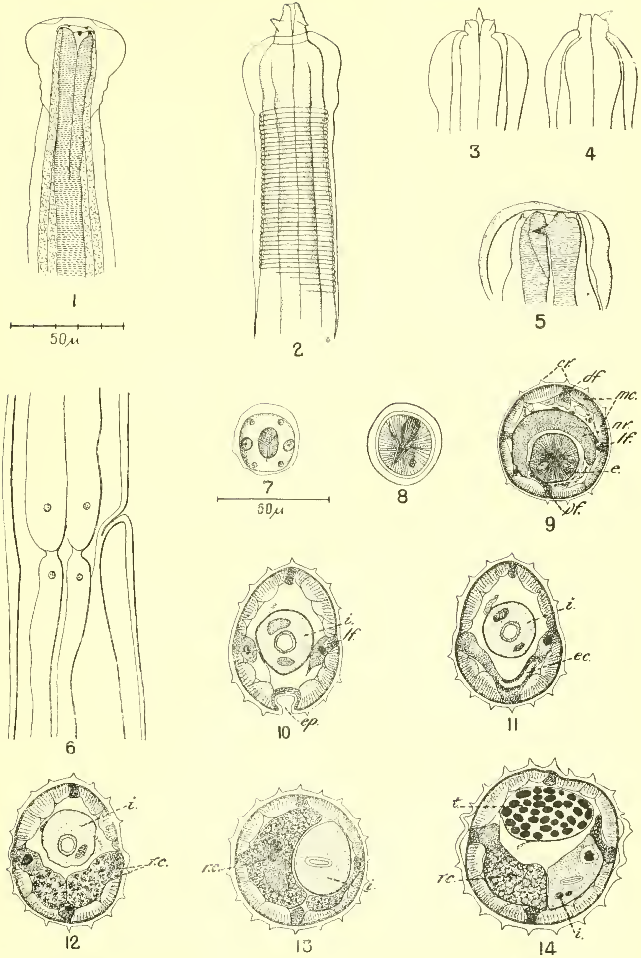
Figs. 24–25. 24. Nematodirus filicollis. Spicule point, lateral and dorsal views. 25. N. spathiger. Spicule points, lateral and dorsal views. Dorsal views show some variations.

Plate 34.

Figs. 26–29. 26. Nematodirus spathiger. Spicules, entire dorsal view. 27. N. furcatus. Spicules, entire ventral view. 28. N. furcatus. Spicule points, lateral and ventral views. 29. N. abnormalis. Spicule points, lateral and dorsal views

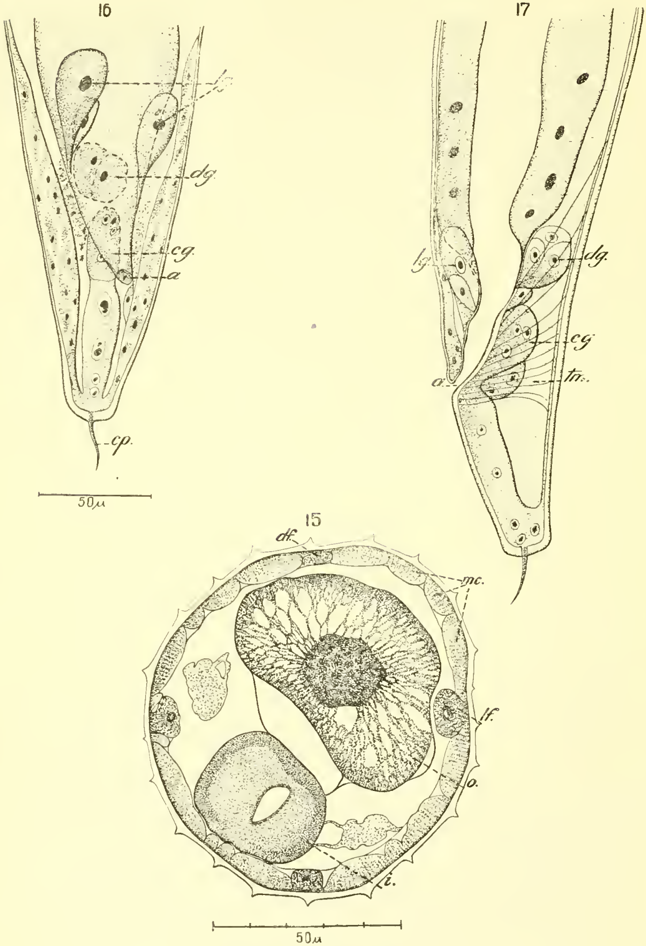
Plate 35.

Figs. 30–31. 30. Nematodirus helvetianus. Spicule points, lateral and dorsal views. 31. N. dromedarii. Spicule point, dorsal view.



NEMATODIRUS FURCATUS AND NEMATODIRUS SPATHIGER.

FOR EXPLANATION OF PLATE SEE PAGE 588.



NEMATODIRUS SPATHIGER.

FOR EXPLANATION OF PLATE SEE PAGE 588.

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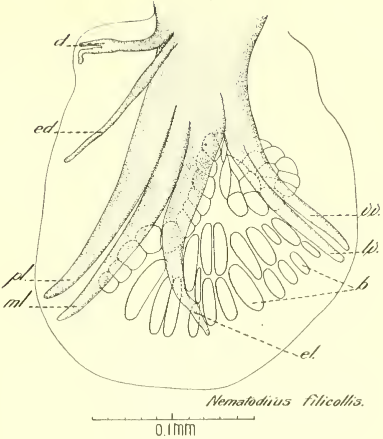
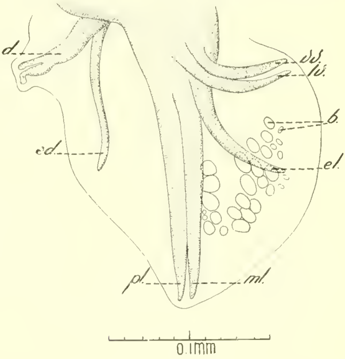


Nematodirus filicollis.

20 *Nematodirus helvetianus.*



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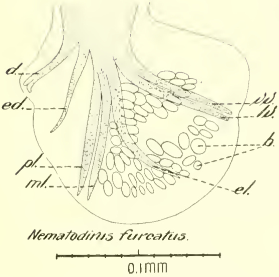

Nematodirus furcatus.

NEMATODIRUS FILICOLLIS, NEMATODIRUS FURCATUS, AND NEMATODIRUS HELVETIANUS.

FOR EXPLANATION OF PLATE SEE PAGE 588.

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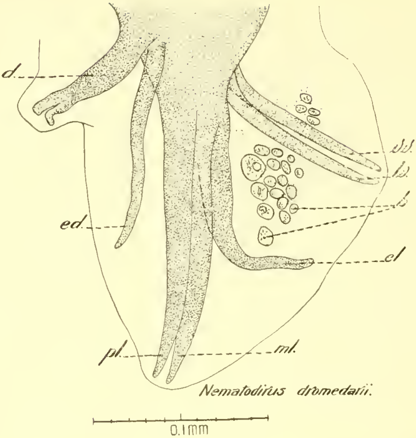
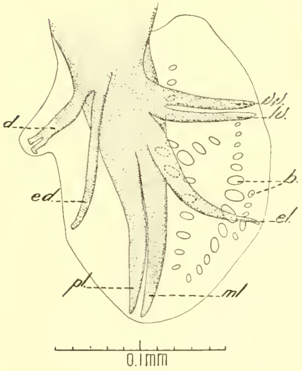


Nematodirus dromedarii.

Nematodirus spathiger.

21



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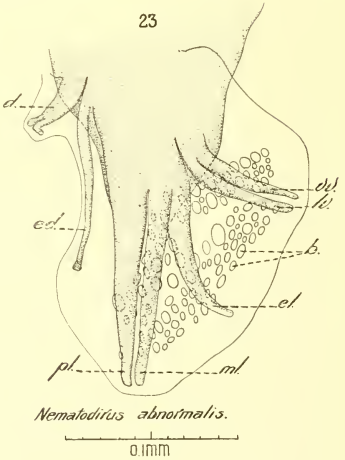
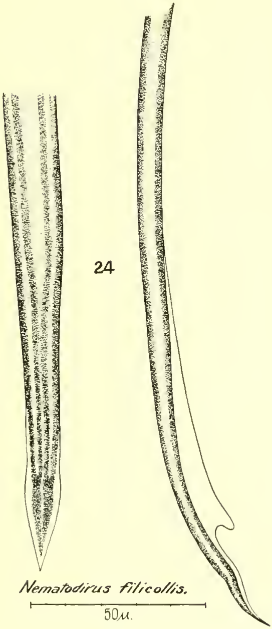


Nematodirus abnormalis.

NEMATODIRUS SPATHIGER, NEMATODIRUS DROMEDARII, AND NEMATODIRUS ABNORMALIS.

FOR EXPLANATION OF PLATE SEE PAGE 588.

24



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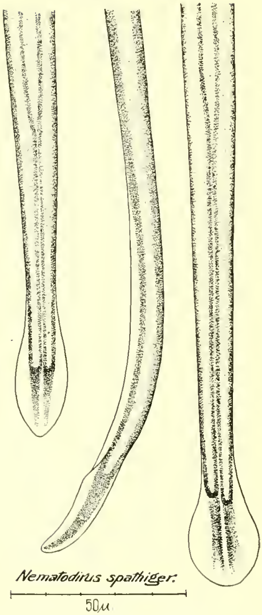
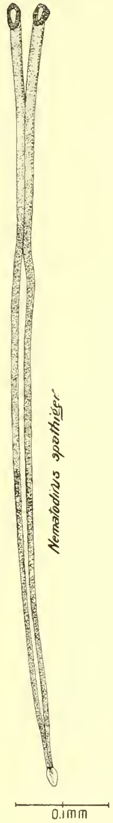


NEMATODIRUS FILICOLLIS AND NEMATODIRUS SPATHIGER.

FOR EXPLANATION OF PLATE SEE PAGE 588.

26



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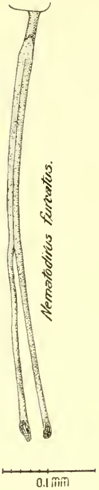

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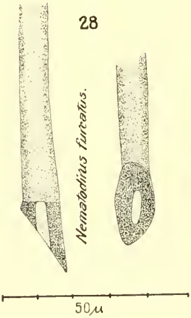

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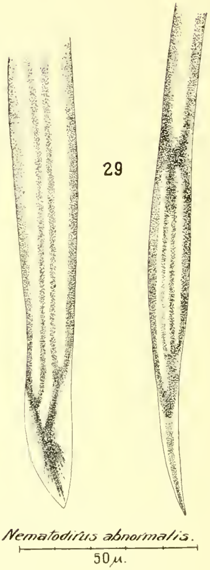
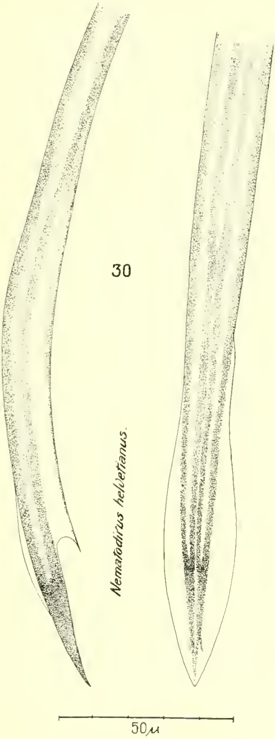


NEMATODIRUS SPATHIGER, NEMATODIRUS FURCATUS, AND NEMATODIRUS ABNORMALIS.

FOR EXPLANATION OF PLATE SEE PAGE 588.

30



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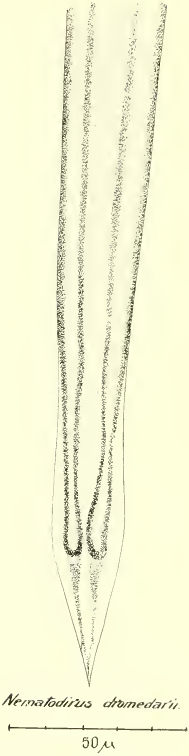

NEMATODIRUS HELVETIANUS AND NEMATODIRUS DROMEDARII.

FOR EXPLANATION OF PLATE SEE PAGE 538.

BOULANGERITE, BISMUTOPLAGIONITE, NAUMANNITE AND A SILVER-BEARING VARIETY OF JAMESONITE.

By Earl V. Shannon,

Assistant Curator, Department of Geology, United States National Museum.

NOTES ON THE COMPOSITION AND OCCURRENCE OF BOULANGERITE

INTRODUCTION.

The mineral boulangerite, a lead sulphantimonite, has long had assigned to it the formula $3PbS.Sb_2S_3$. This is one of the simplest and most probable of the lead sulphantimonites and compounds showing the same ratio of base to acid are among the most numerous, abundant, and widespread in occurrence of the large class of sulphosalt minerals.

In 1875 Rammelsberg[1] collected the then available analyses of boulangerite and, in a discussion of the composition of the mineral, showed that the analyses differed somewhat from each other, some approximating the formula $3PbS.Sb_2S_3$, others yielding ratios closer to $5PbS.2Sb_2S_3$, and still others approaching the composition expressed by the formula $10PbS.3Sb_2S_3$. Quite erroneously he states that the majority of the analyses given agree most nearly with the formula $3PbS.Sb_2S_3$.

In 1899 Sjögren[2] found a mineral at Sala, Sweden, in well-developed crystals similar in form to diaphorite, which he referred to boulangerite. Upon analysis these crystals were found to have the composition expressed by the formula $5PbS.2Sb_2S_3$. He further showed that many of the earlier analyses of boulangerite agreed most nearly with this formula.

In 1917 the present writer analyzed specimens of a steel-gray fibrous sulphantimonite from Superior, Montana, and Mullan, Idaho, both of which gave the formula $5PbS.2Sb_2S_3$. In rather inexcusable oversight of Sjögren's work, especially since it had been made readily available by Hintze,[1] this compound was described as a distinct species and given the name mullanite.[2] Some imperfect crystals gave angles which seemed unlike those of diaphorite, but they were too poor in quality to serve alone as a basis for considering the material distinct from that of Sjögren. Since mullanite evidently had no reasonable claim to distinction and should be eliminated from the literature, it was planned to immediately publish a retraction. Before doing so, however, several new analyses of boulangerites from various localities were made, and the early literature relating to this species was examined critically. Below is given a summary of the literature and descriptions and analyses of boulangerites from several new localities.

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[1] Rammelsberg, C. F., Handbuch der Mineralchemie, p. 99, 1875.

[2] Sjogren, H. S., Geol. Föreningens Förhandlingar, vol. 19, p. 153, 1897.

EARLY DESCRIPTIONS OF BOULANGERITE.

Boulanger[3] in 1835 published an analysis of a "double sulphide of antimony and lead" from Molieres, Department du Gard, France. The material was in crystalline-fibrous bluish-gray metallic masses, having a specific gravity of 5.97. The mineral was associated with pyrite in quartz and was in part altered to antimony and lead oxides and limonite. Boulanger's original analysis is given in the following table, column 1. In column 2 is given the analysis recalculated after deducting impurities, and in column 3 are given the ratios derived from the figures of column 2.

Analysis and ratios of boulangerite from Molieres, France.

	1. Original.	2. Recalculated.	3. Ratios.		
Lead	49.00	53.90	0.2603	29.59	5.57×1.00
Iron	1.10	1.20	.0215		
Copper	.80	.90	.0141		
Antimony	23.20	25.50	.2122	21.22	4.00×1.00
Sulphur	16.90	18.50	.5769	57.69	10.90×1.00
Pyrite	5.60				
Quartz	.60				
Total	97.20	100.00			

The ratios thus give $5.57PbS.2Sb_2S_3$, or midway between the two formulas, $3PbS.Sb_2S_3$ and $5PbS.2Sb_2S_3$. Critical examination of the analysis, however, shows defects which tend to make the ratios unreliable. In the first place, the analysis as given shows a deficiency of 2.8 per cent, a part of which is evidently sulphur. Copper and iron are not commonly constitutional constituents of boulangerite, particularly copper. If we assume these two bases to be extraneous and derived perhaps from chalcopyrite associated with the pyrite, the lead and antimony yield ratios as follows:

---

[1] Hintze, Carl, Handbuch der Mineralogie, vol. 1, p. 1040, 1904.

[2] Shannon, E. V., Amer. Journ. Sci., vol. 44, p. 66, 1918.

[3] Boulanger, C., Annales des Mines, vol. 7, p. 575, 1835.

Pb	.2603	26.03	4.91	5×0.98
Sb	.2122	21.22	4.00	4×1.00

It thus seems very probable that the material worked upon by Boulanger, and hence the mineral which should correctly bear the name boulangerite, was of the composition expressed by the formula $5PbS.2Sb_2S_3$.

The name boulangerite was first actually applied by Thaulow[1] to a metallic mineral occurring in straight parallel fibrous masses resembling jamesonite, from Nasafjeld, Lapland. In column 1 of the following table are given the original figures of Thaulow's analysis; in column 2 the same analysis with the value for antimony reduced to conform with the value at present used for the atomic weight of that element; in column 3 are given the ratios derived from column 2:

Analysis and ratios of boulangerite from Nasafjeld, Lapland.

	1. Original.	2. Recalculated.	3. Ratios.			
Lead	55.57	55.57	0.2683	26.83	5.36	5×1.07
Antimony	24.60	24.07	0.2003	20.03	4.00	4×1.00
Sulphur	18.86	18.86	0.5881	58.81	11.74	11×1.07
Total	99.03	98.50				

These ratios yield almost exactly the $5PbS.2Sb_2S_3$ formula, though showing that the result obtained for antimony is doubtless too low.

Hausmann[2] in 1839 described boulangerite from Nertschinsk, Siberia, having the following properties: Massive, with an indistinctly fibrous structure like some manganites; luster, metallic with a silky appearance; color, blackish lead-gray, streak darker; scratches galena but not sphalerite, hence the hardness around 3. Determinations of the specific gravity gave 5.688, 5.726, and 5.941, the variation being ascribed to impurities. The specific gravity of the pure mineral is stated to be not less than 6. The boulangerite was mixed with arsenopyrite, pyrite, and stibnite being often intimately intergrown with the latter. The specimens were crusted with oxidation products, mainly limonite, and waxy to earthy bindheimite. In the following table the analysis made by Bromeis is given in the original form and with the antimony value corrected, together with the ratios as in the preceding tables.

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[1] Annalen Physik Chemie (Poggendorff's), vol. 41, p. 216, 1837.

[2] Hausmann, J. F. L., Ann. Phys. Chem. (Poggendorff's), vol. 46, p. 281, 1839.

Analysis and ratios of boulangerite from Nertschinsk, Siberia.

	1. Original.	2. Recalculated.	3. Ratios.		
Lead	56.29	56.29	0.2718	27.18	5×1.12
Antimony	25.04	23.29	0.1938	19.38	4×1.00
Sulphur	18.22	18.22	0.5681	56.81	11×1.07
Total	99.55	97.80			

These ratios show that, assuming the deficiency shown by the analysis to be in part due to antimony lost, the mineral like those preceding had the composition expressed by the formula $5PbS.2Sb_2S_3$. The foregoing three original descriptions offer strong evidence in support of the conclusion advanced by Sjögren—namely, that the true formula for boulangerite is $5PbS.2Sb_2S_3$. Later analyses of this mineral from a large number of localities agree almost exactly with this formula. It is not improbable that the compounds $3PbS.Sb_2S_3$ and $10PbS.3Sb_2S_3$ also occur as natural mineral species, but in the absence of distinctive physical and crystallographic data they have been confused with boulangerite, owing to the close similarity in chemical composition existing between the three compounds. The formula $10PbS.3Sb_2S_3$ has been assigned by Frenzel[1] to the substances plumbostib and embrithite, but the analyses are far from satisfactory. An arsenic analogue of this compound has been found in the mineral guitermanite. Specimens of boulangerite from Przibram, Bohemia, analyzed by Boricky and Helmhacker,[2] in part agree fairly well with the formula $3PbS.Sb_2S_3$, as shown in the following table. An equal number of the same series of analyses, however, yields more nearly the 5:2 formula.

Analyses of boulangerite from Przibram, Bohemia.

	Theory $3PbS.Sb_2S_3$.	1	2	3	4
Pb	58.75	57.69	58.13	57.28	57.42
Sb	23.09	21.87	22.81	22.91	25.11
S	18.16	18.89	17.60	17.95	17.74
Fe		.84	.57	1.35	
Ag		.25		.06	
Zn		.47		.34	
Total	100.00	100.01	99.11	99.89	100.27

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[1] Journ. Pract. Chem., vol. 2, p. 360, 1870.

[2] Ber. Akad. Wien., vol. 56, 1867.

A paper by Guillemain[1] gives analyses of material from Ober-Lahr, St. Antonio, and Betzdorf agreeing almost exactly with the formula $3PbS.Sb_2S_3$. These results differ so sharply from those of other analysts on materials from the same localities that they have not been further considered here. The paper contains no reference to the results of Sjögren, published the preceding year.

IDENTITY OF MULLANITE WITH BOULANGERITE.

From the preceding discussion it is clear that the true formula for boulangerite is the same as that originally assigned to mullanite, which, therefore, is chemically identical with boulangerite. The angles measured on the imperfect crystals did not agree with those of diaphorite, as stated in the original paper, but it is not impossible that by adopting a different orientation the observed forms could be referred to the axial values given for boulangerite by Sjögren. Unfortunately the original measurements were not published and the notes are not now available. There exists no sufficient ground for separating the materials called mullanite from typical boulangerite. The first two boulangerites described below are the original occurrences of "mullanite."

BOULANGERITE FROM THE GOLD HUNTER MINE, MULLAN, IDAHO.

In the lead silver ore of the Gold Hunter mine at Mullan, in the Coeur d'Alene district, Idaho, boulangerite is a constant constituent of the more quartzose portions of the ore occurring commonly as small fibrous masses in quartz or as thin acicular needles in small cavities in quartz which are lined with crystals of quartz or siderite. In color the mineral is steel-gray, with a brownish gray to brown streak. The specific gravity of the needles was determined to be 6.407. Excellent specimens are frequently obtained at the mine. Some typical specimens showing abundant needles lining cavities in quartz have recently been received at the United States National Museum from Mr. C. L. Herrick, manager of the mine (Cat. 93760). Upon analysis the needles of boulangerite from this locality yielded the results given below, the iron being due to siderite present as impurity in the sample:

Analysis of boulangerite from Mullan, Idaho.

Lead	53.33
Antimony	24.67
Sulphur	18.11
Arsenic	.64
Iron	1.47
Total	98.22

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[1] Guillemain, C., Zeitschrift Kryst. Min., vol. 33, p. 74, 1900.

BOULANGERITE FROM SUPERIOR, MONTANA.

Boulangerite was a constant constituent of the zinc ore in a vein mined at the Iron Mountain Mine, Superior, Montana, occurring in all of the ore as small disseminated grains and fibers in fine granular sphalerite, and as bunches of coarse fibers with coarse granular dark-brown sphalerite in white quartz. A specimen of typical material in the United States National Museum shows course-fibrous steel-gray boulangerite, with sphalerite in pure white vitreous vein quartz. Upon analysis the material of this occurrence, having a brownish streak and a specific gravity of 6.274, gave the following results:

Analyses of boulangerite from Superior, Montana.

	1	2	Average.
Lead	55. 13	54. 93	55. 05
Antimony	25. 73	25. 69	25. 71
Sulphur	18. 67	18. 97	18. 82
Arsenic	. 25	. 25	. 25
Iron	Trace.	Trace.	Trace.
Total	99. 78	99. 84	99. 83

BOULANGERITE FROM THE NORTH STAR MINE, IDAHO.

The United States National Museum has recently acquired several specimens of the typical mixed ore of the North Star Mine, Wood River district, Blaine County, Idaho. This mine at one time made a considerable production of lead-silver ore from workings within the oxidized zone. When the primary mineralization of the vein was encountered it was found to consist of such refractory mixtures of diverse minerals that the ore could not be mined at a profit, and the mine remained closed for a number of years. Within the past few years new operators have opened the property and have been attempting, by modern metallurgical methods, to separate the valuable minerals of the ore, but with indifferent success.

The ores are reported to consist of intimate mixtures of galena, sphalerite, chalcopyrite, pyrite, pyrrhotite, arsenical pyrite, and "antimony" in a gangue of quartz. The specimens in the United States National Museum collections show galena, pyrite, dark brown sphalerite, arsenopyrite, and a gray antimonial mineral in a gangue of quartz, or, in one case, crystalline dolomite. The gray mineral which heretofore has evidently been mistaken for stibnite is, so far as tested, all boulangerite. This boulangerite is a constant constituent of the ore, not only of the Star mine, but also of a number of adjoining mines, and the total amount of ore in which it forms a prominent constituent must amount to many thousands of tons. The arsenopyrite which is abundant in the ore has a peculiarly brassy yellow color, like pyrite, which disappears when it is immersed in dilute hydrochloric acid. It forms slender prismatic crystals, averaging 1 centimeter long by 1 millimeter in diameter, showing usually only the unit prism, terminations being very rare.

The boulangerite has the usual steel-gray color and metallic luster and exhibits the characteristic brownish streak. It occurs as compact parallel-fibrous masses, as slender needles lining cavities, and as compact and slightly schistose massive forms with other sulphides, the massive variety evidently having been subjected to pressure. The boulangerite is commonly the youngest mineral of the vein, and it often lines cavities or occupies the spaces between the crystals making up quartz combs. Upon analysis a sample of the boulangerite gave the results in column 1 below. In column 2 the analysis is recalculated to 100 per cent after deducting gangue.

Analysis of boulangerite from the North Star mine, Idaho.

	1. Original.	2. Recalculated.
Lead	49. 44	55. 52
Silver	Trace.	Trace.
Iron	. 38	. 43
Antimony	21. 03	23. 63
Arsenic	. 94	1. 06
Sulphur	17. 24	19. 36
Insoluble	10. 86	....
Total	99. 89	100. 00

BOULANGERITE FROM THE INDEPENDENCE MINE, IDAHO.

A specimen from the Independence Mine, Wood River mining district, Idaho, consists of coarse granular white vein quartz containing abundant small pyritohedral crystals of pyrite and fibrous masses of boulangerite. One side of the specimen bears a felted or curved fibrous mass of steel gray boulangerite, and a joint surface which bounds the specimen on one side bears small rosettes of radiating, deeply striated, short prismatic crystals of boulangerite showing well-defined cleavage parallel to the elongation. In color the boulangerite is rather light silver-gray and its streak is brownish-gray on paper and distinctly brown on porcelain. A selected sample of the compact, curved, fibrous material gave upon analysis the results tabulated below:

Analysis of boulangerite, Independence Mine, Idaho.

Insoluble	3. 58
Lead	53. 79
Silver	Trace.
Iron	. 41
Antimony	23. 83
Arsenic	. 12
Sulphur	18. 11
Total	99. 84

BOULANGERITE FROM PERU.

An exceptionally fine specimen of typical "mineral wool," recently received by the United States National Museum, has been examined and found to be boulangerite. The specimen came to the department of geology indirectly through the Division of Mineral Technology, and little is known regarding its history other than that it probably came from the Panama-Pacific exposition. It was with a lot of ores labeled Peru. A small label on one end of the specimen bears the words "Atlante No. 10," and a fragment of a label found with the specimen, so far as it could be deciphered, read: "S. S. Fluke------veta nueva------distanci 7----ds de Huanca----Seca, Se llama San Antonio."

Occurrence.—The boulangerite coats the upper surface of the specimen with a soft mat of interlaced fibers, covering an area 12 by 16 centimeters. The specimen, which is 12 by 16 by 9 centimeters in maximum dimensions, evidently represents the crust from one wall of a partly filled fissure. The specimen illustrates very beautifully the paragenesis and association of the minerals of the vein. The first deposit on the walls of the fissure was resinous dark-brown sphalerite, which, mixed with a very little pyrite and galena, forms a layer averaging 3 millimeters in thickness. Next came bluish white to white greasy quartz, which forms a massive layer up to 5 centimeters in thickness, upon the surface of which was deposited a crust or comb of long needlelike transparent quartz crystals, averaging 1.5 centimeters in length, with a thickness of from 1 to 2 millimeters. Upon the comb of quartz crystals was next formed a thin layer of arsenopyrite in crystals up to 3 millimeters in diameter, followed by pearly buff manganiferous siderite, which makes a crust composed of large and somewhat curved rhombohedral crystals 2 centimeters or more on an edge. The boulangerite forms a wool-like mass of matted fibers, 1 to 2 centimeters thick, covering the siderite. It was the last mineral in the vein to be deposited.

Physical properties.—The boulangerite is in the form of exceedingly thin dark steel gray fibers, matted together in a loosely coherent felt. The individual fibers are very flexible. Owing to the minuteness of the crystals and their manner of aggregation, the specific gravity and hardness of the mineral could not be determined. The streak is distinctly brownish gray to brown.

Chemical composition.—A sample of the wool-like material picked from the felted mass was analyzed, yielding the composition given in the following table:

Analysis of boulangerite from Peru.

	Per cent.
Insoluble	0.36
Iron	0.47
Lead	54.34
Silver	Trace.
Antimony	25.33
Sulphur	18.51
Total	99.01

A slight evolution of carbon dioxide took place upon solution of the mineral in hydrochloric acid, indicating that a small amount of siderite was included in the sample as impurity. The iron may all be in this form, and the 1 per cent loss is probably CO_2 and MnO.

BOULANGERITE FROM OBER-LAHR, GERMANY.

A specimen of boulangerite in the United States National Museum collections, labeled Ober-Lahr, Germany, was received in exchange from Mr. B. Sturtz in 1886 (Cat. 47,005). The specimen is almost entirely composed of the boulangerite, the only impurities being rare grains of buff manganiferous siderite and quartz. The boulangerite is wholly devoid of any trace of fibrous structure, being completely massive, with a schistose structure, somewhat rounded and contorted and apparently due to pressure. The color is somewhat darker than that of the fibrous boulangerites previously described, being comparable with that of some massive tetrahedrite. The mineral assumes a bluish tarnish. The streak is the characteristic brownish color typical of boulangerite. Upon analysis the material of this specimen yielded the following results:

Analysis of boulangerite from Ober-Lahr, Germany.

	Per cent.
Lead	54.44
Silver	Trace.
Antimony	24.55
Sulphur	18.98
Insoluble	1.50
Total	99.47

BOULANGERITE FROM PRZIBRAM, BOHEMIA.

A specimen in the United States National Museum collections (Cat. 83,983) from Przibram looks precisely like the specimen from Ober-Lahr. The color, structure and streak are the same. The curved schistose structure is more pronounced, the platy layers curving completely around one end of the specimen. The boulangerite contains considerable quartz and buff manganiferous siderite and a little fine-grained galena. A sample selected carefully, in order to avoid galena, upon analysis afforded the following results:

Analysis of boulangerite from Przibram, Bohemia.

	Per cent.
Lead	55.08
Antimony	24.38
Iron	Trace.
Sulphur	18.65
Insoluble	1.10
Total	99.21

BISMUTOPLAGIONITE FROM WICKES, MONTANA.

The name bismutoplagionite was recently given by the present writer to a new lead sulphobismuthite received by the United States National Museum from Mr. Tim McCarthy, of Wickes, Montana.[1] The specimens of ore in which the new mineral occurs came in through the routine channels, with the request that the minerals be identified and that the material be tested for platinum. Blowpipe tests made by Mr. W. F. Foshag, of the Division of Mineralogy, indicated that the gray constituent which was present in small amount in a few of the pieces consisted essentially of a sulphide of bismuth and lead. Further correspondence with the sender resulted in the obtaining of a few additional small pieces of the ore, some of which contained the gray bismuth-bearing mineral.

OCCURRENCE.

Nothing was learned about the locality from which the specimens were obtained, but it is presumed that they came from some undeveloped prospect in the vicinity of Wickes, which is a small mining town in Jefferson County, north of Boulder. The specimens as received consist of chunks an inch or two in diameter, consisting mainly of coarsely crystalline pyrite, showing cubic crystals with the corners truncated by octahedral planes. These masses of pyrite contain, in addition to the bismuth mineral, nests of yellowish scaly sericite, masses and prismatic crystals of quartz, and small aggregates of chalcopyrite, tetrahedrite, and galena. The minerals other than the bismutoplagionite occur in connection with the masses of quartz. The bismuth mineral occurs rarely with the galena and tetrahedrite, but for the most part it occurs interstitially with regard to the pyrite crystals and in masses of the latter mineral which are free from the other metallic minerals. Such pieces, when polished and examined microscopically, show no lack of homogeneity in the gray mineral. Only specimens which were unquestionably free from galena and tetrahedrite were used in the analysis. The bismutoplagionite is molded around both pyrite and quartz crystals. In one small cavity between pyrite crystals the bismutoplagionite was found to form small prismatic needles.

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[1] Shannon, E. V., Amer. Journ. Sci., vol. 49, pp. 166–188, 1920.

PHYSICAL PROPERTIES.

In appearance the new mineral is not distinctly different from cosalite, galenobismutite, or many other sulphosalts of lead. The color is slightly bluish lead-gray and the luster is rather dull metallic. The aggregates are indistinctly fibrous, the fibers curving about idiomorphic crystals of pyrite or quartz, which, when removed, leave lustrous molds in the gray mineral. There are one or more ill-defined cleavages parallel to the elongation of the fibers. In one instance the bismuth mineral formed very minute free acicular crystals, extending across a minute cavity between pyrite crystals. These needles were too minute for measurement, were not terminated, and were deeply striated parallel to the elongation. The fibrous habit of the massive material, the elongate striated needles, and the cleavages parallel to the elongation unite to suggest that bismutoplagionite is probably orthorhombic in crystallization. The streak of the mineral is dull brownish-gray; the hardness 2.8 and the specific gravity 5.35.

PYROGNOSTICS.

Before the blowpipe alone on charcoal bismutoplagionite fuses to a brittle globule and yields a coating which is yellow nearest the assay (lead) and white in its outer portion (bismuth). With sodium carbonate it is reduced to a metallic button, yielding similar coatings on the coal. In the closed tube it yields sublimates of yellow sulphur and black antimony sulphide. In the open tube abundant sulphur dioxide is given off, and at a high temperature there is formed a heavy sublimate, which is yellow when hot and yellowish white when cold. With potassium iodide-sulphur mixture a strong bismuth reaction is obtained.

CHEMICAL COMPOSITION AND PROPERTIES.

It was quite impossible to obtain a sample for analysis which did not contain pyrite, as the two minerals were found to be very intimately mixed. Several lumps of the pyrite-bismutoplagionite aggregate which, upon examination of polished surfaces, seemed to contain no additional minerals, were crushed to an average grain of 2 to 3 millimeters. From this granular sample the purest grains of the gray mineral were selected and each grain was examined with a high-power lens without detecting any galena or other impurity. This selected material was then ground and screened and used for analysis. The sample contained abundant pyrite, but this occasioned slight concern since preliminary tests had shown that the lead-bismuth mineral was completely soluble in hot concentrated hydrochloric acid while the fresh clean pyrite was not appreciably attacked. The portion taken for analysis was dissolved on the steam bath with concentrated hydrochloric acid and the insoluble material was caught and washed thoroughly on a Gooch crucible, dried at 105 degrees and weighed. It consisted mainly of pyrite which was later proven free from any trace of lead or bismuth. The solution was then analyzed by standard methods, yielding the results given below:

Analysis of bismutoplagionite.

Insoluble	18.88
Lead (Pb)	26.15
Iron (Fe)	.58
Antimony (Sb)	2.41
Bismuth (Bi)	37.14
Sulphur (S) (calculated)	14.17
Total	99.33

Because of the complications introduced by the large amount of pyrite present, sulphur was not directly determined—an omission not serious in view of the fact that the constituent bases, when calculated to their respective sulphides, bring the total reasonably close to 100 per cent. On the assumption that the pyrite was attacked to a slight extent by the acid, the iron found in solution is deducted as pyrite (FeS_2). The composition derived for the gangue free bismuth mineral, in terms of 100 per cent, is given below, together with the ratios derived from the percentage figures:

Recalculated analysis and ratios of bismutoplagionite.

	Per cent.	Ratios.			
Lead	33.02	0.1594	15.94	5.31	5×1.01
Bismuth	46.90	.2255	25.08	8.36	8×1.00
Antimony	3.04	.0253			
Sulphur	17.04	.5313	53.13	17.71	17×1.00

These ratios indicate exactly the formula:

$$Pb_5(Bi,Sb)_8S_{17}, \text{ or } 5PbS.4(Bi,Sb)_2S_3.$$

or the compound is $5PbS.4Bi_2S_3$, with the Bi in small measure replaced by Sb, the molecular ratios of bismuth to antimony being approximately as 9:1. This formula brings the mineral in line, chemically, with plagionite and liveingite, the formulas for the three minerals being:

Plagionite	$5PbS.4Sb_2S_3$.
Bismutoplagionite	$5PbS.4Bi_2S_3$.
Liveingite	$5PbS.4As_2S_3$.

That bismutoplagionite is strictly isomorphous with plagionite and liveingite does not necessarily follow. The latter minerals are of the monoclinic division of these sulphosalts, while bismutoplagionite is probably orthorhombic. Dimorphism is very common in the sulpho minerals, and it is not improbable that orthorhombic forms having the compositions of plagionite and liveingite occur or that a monoclinic modification of the compound $5PbS.4Bi_2S_3$ may be found.

SILVER JAMESONITE FROM IDAHO.

A specimen of silver ore from the Poorman Mine, Silver City district, Owyhee County, Idaho, preserved in the study series of ores in the United States National Museum, was found to consist in large part of a light-gray metallic mineral which was not immediately identifiable. Subsequent analysis indicates that this is a lead sulphantimonite similar in composition to jamesonite, but unusual in containing an appreciable amount of silver.

OCCURRENCE.

The mineral occurs in rather large amount in a typical rather coarsely crystalline white vein quartz, which is loose textured as from combs of crystals grown together from opposite sides of a narrow vein. Where cavities occur in the specimen they are bounded by plane faces of quartz crystals. The deposition of the sulphantimonite began before the quartz crystals had ceased to grow, as shown by the quartz crystals in some cases including variously oriented needles of the metallic mineral. The deposition of the latter mineral continued after the cessation of growth by the quartz crystals, until nearly all of the intercrystal spaces were solidly filled with the jamesonite. When the quartz is broken up, prismatic crystals are loosened, leaving lustrous molds in the gray mineral. The only other minerals in the specimen are rare stains of pyrargyrite, resinous yellow grains of sphalerite, and small nests of sericite.

PHYSICAL PROPERTIES.

The sulphantimonite is somewhat unusual in appearance, being quite unlike ordinary jamesonite. In color it is very light gray on fresh fracture, almost silver white, and the luster is metallic splendent. The masses are fine grained and show only a faint suggestion of fibrous structure. At its contact with some of the clearer quartz crystals, however, the mineral is in distinct needles penetrating the quartz. Polished sections examined with vertical illumination show every gradation from wholly massive material to material made up of interlaced prismatic needles. Careful examination of polished surfaces failed to demonstrate the presence of more than one mineral in the gray masses. In very rare and small cavities in the quartz the sulphantimonite occurs in free needles of very minute size, which are entirely too small for goniometric measurement. Upon examination these needles were found to be exceedingly brittle, breaking across the elongation at the slightest touch, in a manner indicating a rather perfect cleavage in this direction. Upon exposure the mineral assumes a faintly yellow color. The hardness is about 2.5. When rubbed upon paper the mineral gives a gray mark like that made by hard graphite, but its streak upon unglazed porcelain is reddish brown.

PYROGNOSTICS.

The blowpipe characteristics of the mineral are the usual ones for sulphantimonites of lead. In the open tube it yields sulphur dioxide and a heavy sublimate of white antimony oxide. In the closed tube fragments melt and yield a faint upper ring of antimony oxide, succeeded downward by a yellow ring of sulphur, a red band of antimony oxysulphide, and a black coating of antimony sulphide.

CHEMICAL PROPERTIES.

The mineral is completely soluble in hot concentrated hydrochloric acid. Selected fragments of the mineral when separated from quartz were analyzed with the results given in the following column:

Analysis of silver jamesonite.

Lead (Pb)	40.77
Copper (Cu)	.75
Iron (Fe)	.46
Sliver (Ag)	7.40
Antimony (Sb)	30.61
Sulphur (S)	20.81
Total	100.80

This analysis yields the ratios given in the following table:

Ratios of silver jamesonite.

PbS	1,969	1,969	8.00	9.97	2×1.00
Ag_2S	343	484	1.97		
Cu_2S	59				
FeS	82				
Sb_2S_3	1,274	1,274	5.18	5.18	1×1.04

The amount of sulphur given in the analysis is somewhat higher than required by the bases present, a fact possibly traceable to an error in the analysis. From the above ratios it is evident that the mineral agrees very closely with the simple formula given in most textbooks for jamesonite, namely, $2PbS.Sb_2S_3$. Taking the silver into account we have for the present mineral the formula:

$$2(Pb,Ag_2)S.Sb_2S_3,$$

with lead and silver present in definite ratios as $Pb:Ag_2=4:1$. Expanding the above formula gives—

$$8PbS.2Ag_2S.5Sb_2S_3,$$

with silver (Ag_2) in small measure replaced by copper (Cu_2) and iron (Fe).

In a recent paper Spencer[1] writes that jamesonite showing the brittleness of the needles, which indicates transverse cleavage, does not agree with the formula commonly given, but has the composition expressed by the formula $7(Pb_{4/5}Fe_{1/5})S.4Sb_2S_3$, and shows that the more generally accepted formula $2PbS.Sb_2S_3$ belongs rightly to plumosite, the needles of which are flexible and not brittle. Schaller,[2] more recently still, proposes a different formula for jamesonite—namely, $4PbS.FeS.3Sb_2S_3$. The present mineral may be compared with these two proposed formulas as follows:

$4PbS. FeS. 3Sb_2S_3$	Jamesonite (Schaller).
$4PbS. Ag_2S. 2\frac{1}{2}Sb_2S_3$	Idaho silver jamesonite.
$7(Pb_{4/5}Fe_{1/5})S.4Sb_2S_3$	Jamesonite (Spencer).
$7(Pb_{4/5}(Ag_2)_{1/5})S. 3.48Sb_2S_3$	Silver jamesonite.

Taking into account the perfect cleavage manfested by the brittleness of the needles, and the fact that silver almost completely replaces the iron which has been regarded as an essential constituent of jamesonite, the present mineral is designated silver jamesonite rather than simply argentiferous jamesonite. Were it not for the stress laid by recent writers on the value of the cleavage as a diagnostic characteristic of jamesonite it might perhaps have been better to call the Silver City mineral simply argentiferous plumosite.

The mineral above described does not differ greatly in composition from the argentiferous jamesonite from the Sheba mine, Star City, Nevada, described by Burton.[3] This mineral is described as silver-white to bluish-white in color, massive to coarsely fibrous or columnar in structure with a hardness of 2.5 and a specific gravity of 6.03. It was associated in quartz with sphalerite and tetrahedrite. Selected samples gave, upon analysis, the results in the following table.

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[1] Spencer, L. J., Mineralogical Magazine, vol. 14, p. 207, 1907.

[2] Schaller, W. T., U. S. Geological Survey Bull. 490, p. 26, 1911.

[3] Burton, B. S., Amer. Journ. Sci., vol. 45, p. 36, 1868.

Analyses of argentiferous jamesonite from Nevada.

	1	2	Average.
Lead (Pb)	44. 25	43. 68	43. 86
Silver (Ag)	6. 15	6. 13	6. 14
Copper (Cu)	1. 72	1. 39	1. 55
Iron (Fe)	. 05	. 05	. 05
Antimony (Sb)	29. 08	29. 45	29. 26
Sulphur (S)	....	19. 06	19. 06
Total	....	99. 76	99. 92

The formula derived by Burton from this analysis is:

$$2(Pb,Ag,Cu)S.Sb_2S_3.$$

NAUMANNITE FROM IDAHO.

In the course of a general mineralogical investigation of the Economic Geology Collections of the United States National Museum, the writer recently examined a specimen, supposed to be argentite, from the De Lamar mine, Silver City district, Owyhee County, Idaho. This specimen has been proven by analysis to consist of naumannite, the rare selenide of silver, which has not heretofore been reported from any locality in the United States.

OCCURRENCE.

The specimen in question, which is labeled "Argentite nugget coated with clay, De Lamar Mine," was collected by Eldridge in 1893, and is catalogued as number 201 of the set of ores illustrating his report on a Geologic reconnaissance across Idaho.[1]

The De Lamar mine has been in the past an exceedingly rich and profitable gold-silver mine, having produced precious metals to the value of $6,000,000 within as many years after the discovery of the main ore body. Several veins of the same system have been worked. The inclosing rock is rhyolite, and the veins are filled fissures, the gangue being mainly a peculiarly platy quartz, which is pseudomorphous, probably after calcite or barite. All of the veins terminate abruptly at a great transverse fissure filled with soft kaolinitic clay, derived by crushing and alteration of the material of the walls. This great clay gouge, which is locally designated the " iron dike," has had the effect of damming the mineralizing solutions and greatly localizing the deposition of the ores. Near the under side of the clay vein were the " silver stopes," where the veins upon approaching the " iron dike " were unusually rich, and bunches of rich ore also occurred in the separating country rock. In the crevices immediately adjacent to the "iron dike" argentite and ruby silver were found in nuggets embedded in clay, and small streaks of whitish kaolin, strongly impregnated with argentite, were also rich in gold. Some clayey streaks in the hanging walls of veins elsewhere in the mine are also rich in argentite, although as a whole the mine is predominantly a gold mine. The minerals of the vein include native gold, argentite, and ruby silver, and, near the surface, some cerargyrite.[1] The ruby silver of this mine is largely miargyrite. The specimen of naumannite described below was supposed to be typical of the larger nodules of argentite occurring in the clay seams. To what extent the so-called argentite consisted of naumannite is not known, but it is far from impossible that nearly all of the abundant nuggets and streaks of so-called silver sulphide which occurred in kaolin in this mine may have been naumannite. It is to be hoped that other specimens of these ores can be secured for examination.

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[1] Eldridge, George H., U. S. Geol. Survey, Ann. 16, pt. 2, 1895.

PHYSICAL PROPERTIES.

The specimen is an irregular flat rectangular nodule about 10 by 7 by 3 centimeters in maximum dimensions and weighing about 475 grams. Little of the metallic mineral was visible on the exterior of the nodule, which was completely coated with a tenacious layer of grayish clay. The interior of the nodule consists of the heavy metallic mineral which is so tenacious and malleable that projecting corners are broken from it with difficulty. On broken surfaces it is seen to have a hackly fracture and dark blue-gray color. The luster is metallic, and the surface, upon exposure, does not become appreciably dulled, nor does it assume the furred appearance characteristic of argentite. When polished sections are examined under the microscope with vertical illumination the mineral is seen to be pure except for the clayey matter which is scattered in grains and small patches throughout the mass, and marcasite, which forms small disseminated points in the silver mineral. The hardness is about 2.5. The streak on paper is dark brownish gray; on porcelain, gray, faintly shining. A specific gravity determination on fragments containing 5 or 6 per cent of clay gave the value 6.527.

PYROGNOSTICS.

Heated before the blowpipe on charcoal the mineral yields selenium immediately, and colors the flame blue with the production of the characteristic selenium odor, leaving a large mass of malleable silver. In the closed tube it gives odors of sulphur and selenium, and yields a series of sublimates in rings which grade from yellow (sulphur) at the top, through red (selensulphur), to deep red and black (selenium). In the open tube there are obtained odors of sulphur, and especially selenium, and a white ring of volatile crystals of selenous oxide, which is faintly red in its lower portion from the presence of unoxidized selenium. The silver remaining behind is quite pure and hence is difficultly fusible.

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[1] Lindgren, W., U. S. Geol. Survey, Ann. 20, pt. 3, p. 127, 1900.

CHEMICAL PROPERTIES.

The mineral is insoluble in hot concentrated or dilute hydrochloric or sulphuric acids, but dissolves readily in hot concentrated nitric acid. Samples free from the clay gangue could not be obtained, as the mineral is too malleable to admit of pulverization. It was thus necessary to estimate the amount of clayey impurity in the sample analyzed from the amount of insoluble residue (ignited) obtained from the mineral. A preliminary examination of the purest and whitest clay which could be scraped from the crust gave the following results:

Insoluble matter (ignited)	87. 70
Silver	1. 14
Selenium and sulphur (calculated)	. 34
Water plus loss (by difference)	10. 82
	100. 00

In the analyses the amount of insoluble material found, after ignition, was multiplied by the factor 1.1234 and deducted from the weight of the sample taken. After this deduction the analysis gave the results given in column 1 below. Since the sample contained some marcasite, the amount of iron found is deducted, together with sulphur to form FeS_2, leaving the results given in column 3 of the following table. In column 3 the figures are recalculated to show the composition of the naumannite, free from marcasite, in terms of 100 per cent.

Analysis of naumannite from Idaho.

	1. Original analysis.	2. Marcasite deducted.	3. Recalculated.
Silver	74. 13	74. 13	75. 98
Iron	. 90	....	....
Selenium	22. 37	22. 37	22. 92
Sulphur	2. 10	1. 07	1. 10
Total	99. 50	97. 57	100. 00

Column two of the above table yields the following ratios:

Ratios of naumannite.

Silver (Ag_2)	0.3436	10.32	10.32	1×1.04
Selenium (Se)	0.2824	8.48	9.48	1× .96
Sulphur (S)	0.0333	1.00		

The mineral thus agrees reasonably well with the formula usually assigned to naumannite, Ag_2Se, the selenium (Se) being replaced to a slight extent by sulphur (S). Aside from this replacement and from the mechanical impurities mentioned, the material is remarkably pure silver selenide, careful determinations having proven that lead, copper, gold, zinc, arsenic, antimony, bismuth, and tellurium were either absent or present in minute traces.

The ratio of selenium to sulphur is so great (17:2) that the mineral must be designated naumannite, Ag_2Se, rather than aguilarite, $Ag_2S.Ag_2Se$, in which sulphur and selenium are present in molecularly equal amounts.

AMPHIBIANS AND REPTILES FROM SOUTHERN PERU COLLECTED BY THE PERUVIAN EXPEDITION OF 1914-1915 UNDER THE AUSPICES OF YALE UNIVERSITY AND THE NATIONAL GEOGRAPHIC SOCIETY.

By Thomas Barbour and G. K. Noble,
Of the Museum of Comparative Zoology, Cambridge, Massachusetts.

Mr. Edmund Heller, who was engaged as naturalist by the Peruvian Expedition of 1914–1915 under the auspices of Yale University and the National Geographic Society to southern Peru, collected a number of amphibians and reptiles. While Mr. Heller's primary interests were mammals and birds, nevertheless he secured some interesting lower vertebrates. Not a few of these, notably the Teiids, were caught in his cyclone traps set for small rodents. Unless otherwise mentioned all of the specimens considered here were collected by Mr. Heller.

There is considerable diversity of usage in the spelling of some of the place names. For example, Machu Picchu is sometimes and probably correctly spelled Macchu Picchu. In this paper we have followed the spelling used on a map compiled for the expedition by A. H. Bumstead, C. F. Maynard, and others.

It is a pleasure to thank Dr. Hiram Bingham, leader of the expedition, and the authorities of the National Geographic Society and of the United States National Museum for the privilege of studying and reporting upon this collection. By the articles of agreement under which the collections were made they become the property of the United States National Museum. A series of duplicates has, however, been added to the collections of the Museum of Comparative Zoölogy by permission.

Class AMPHIBIA.

1. BUFO MARINUS (Linnaeus).

Three half-grown specimens (U.S.N.M. Nos. 60802–4) from San Miguel bridge over the Urubamba River, near the ruins of Machu Picchu, altitude 6,000 feet, July 2, 1915; another half-grown specimen (U.S.N.M. No. 60750) from the Cosireni River, August, 1915;

one young individual (U.S.N.M. No. 60772) from San Fernando, October 15, 1915; one very young one (U.S.N.M. No. 60752) from Santa Ana, 3,400 feet, October, 1915; and three large adults (U.S.N.M. Nos. 60799–801) from the same locality, but taken in December.

2. BUFO SPINULOSUS Wiegmann.

Nineteen adult and young specimens (U.S.N.M. Nos. 60789–98 and 60757–65) from Huarocondo, 11,000 feet altitude, April, 1915; 11 specimens of various ages (U.S.N.M. Nos. 60773–8 and 60805–9) from Chospiyoc, 10,000 feet, July, 1915; 10 adults (U.S.N.M. Nos. 60779–88) from Yuveni on the Cosireni River, 4,000 feet, September 5, 1915.

3. BUFO INCA Stejneger.

A single specimen from Idma, 6,000 feet, October, 1915 (U.S.N.M. No. 60771).

Stejneger has kindly compared this specimen with his type and has informed us by letter that the two specimens "agree in all essential points, even to that of the size of the specimens." In the present specimen "the snout is possibly a trifle less protruding, the postorbital crest less definite, though even in the type the crest is not well pronounced. The hind legs * * * are also slightly shorter [than in the type] and the tubercles on the underside of the tarso-metatarsus less developed."

In the original description the notes on the coloration were accidentally omitted. The specimen before us is slightly darker than the type, but Stejneger tells us that the color pattern is much the same.

The coloration in our specimen is as follows: Ground color (in alcohol) a pale fleshy pink or gray; a pale vertebral stripe of the same color; the whole upper surface covered with a zigzag pattern of black and brown; of this pattern the most distinct figure is a dark brown, black-edged cross extending from the eyelids to the mid-dorsal region and cut mesially by the light vertebral line; the posterior extremities of this cross-like figure continue to the inguinal region as a more or less well-defined pair of dark stripes; below these stripes on either side another black line extends from above the tympanum, across the paratoid gland to the inguinal region; a light colored dorso-lateral stripe is present on either side between the dark stripes; hind limbs irregularly but conspicuously cross-barred; ground color of ventral surface a pale yellow; throat and chest rather heavily marbled with dark brown, the marks decreasing in number posterity.

Bufo inca is apparently a close ally of *Bufo ockendoni.* To judge from the descriptions, we are inclined to consider them so closely related that, if distinct at all, they probably represent at most two geographical races of the same species.

4. LEPTODACTYLUS RUBIDO Cope.

One adult (U.S.N.M. No. 60755) from the Comberciato River, 1,800 feet altitude, near the great bend of the Urubamba; another (U.S.N.M. No. 60756) from Idma, near Santa Ana, October, 1915; and two well-developed tadpoles (U.S.N.M. No. 60751), probably referable to this species, from Ñusta Hispaña, June 11, 1915, E. C. Erdis, collector.

The two adults have been compared with the three type specimens[1] and have been found identical with them in physical features. The coloration is much darker, however, in our specimens, but this is probably due to the types being faded and the fresh specimens having been preserved in formalin.

5. GASTROTHECA BOLIVIANA (Steindachner).

One adult female and two half-grown individuals (U.S.N.M. Nos. 60766–8) from Huarocondo, 11,000 feet altitude, April, 1915; two adult males (U.S.N.M. Nos. 60753–4) from Tocopoqueya in the Occobamba Valley, July 25; and one adult male (U.S.N.M. No. 60769) from Yuveni in the Cosireni Valley at an altitude of 4,000 feet, September, 1915.

This series agrees very well with another lot (M. C. Z. 2576) from Sucre, Bolivia, but all these specimens differ from the original description of the species in having a slight rudiment of a web and in having only an indistinct glandular fold on each side of the body. *Gastrotheca boliviana* is closely related to *Gastrotheca peruana* (Boulenger). The two species form a group by themselves very distinct from all other described species of *Gastrotheca*. *G. boliviana* differs from *G. peruana* in the following characters:

1. Vomerine teeth in two oval groups between and partly below the choanae (*G. boliviana*), instead of vomerine teeth in two short, straight transverse series between the choanae (*G. peruana*).
2. A glandular fold from the eye along the edges of the body (*G. boliviana*), instead of warts of the back of unequal size, the largest of which are paratoid-like and may be confluent into longitudinal folds (*G. peruana*).
3. Toes without webs (but a rudiment of a web is present in our specimens of *G. boliviana* from Bolivia), instead of toes one-third webbed (*G. peruana*).
4. Tibio-tarsal articulation reaches the hinder edge of the eye, or sometimes to the nostril (*G. boliviana*), instead of tibio-tarsal articulation reaches the tympanum or the eye (*G. peruana*).

G. peruana is probably the northern representative of the *G. boliviana* stock. Our specimens may possibly represent an intermediate form. If so, they are doubtless more closely related to *G. boliviana* than to *G. peruana*.

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[1] Acad. Nat. Sci., Philadelphia, Nos. 11392–4.

Eleutherodactylus binghami Stejneger[1] is synonymous with this species. We have examined two paratypes (Mus. Comp. Zool. Nos. 4173–4) of *E. binghami* and have come to the conclusion that they represent the young of *G. boliviana.* The foot of this species of *Gastrotheca* has a very short web, but the terminal phalanges are nevertheless claw-shaped.

Class REPTILIA.

Suborder SAURIA.

6. STENOCERCUS TORQUATUS Boulenger.

One adult specimen from Santa Ana (U.S.N.M. No. 60725); three adults (U.S.N.M. Nos. 60731–3) from the Cosireni River, 4,000 feet altitude; six adults and one young (U.S.N.M. Nos. 60710–13 and 60736–8) from San Fernando, 4,500 feet, October, 1915.

The specimen from Santa Ana agrees well with Boulenger's description of the squamation, but differs in coloration and shows only a trace of the ante-humeral band. The three specimens from the Cosireni River, however, have this marking better developed.

7. LIOLAEMUS ANNECTENS Boulenger.

One adult from the Cosireni River, 4,000 feet altitude, September 5, 1915 (U.S.N.M. No. 60709).

A single specimen is apparently referable to this species and not to *L. multiformis* Cope, if the two are really distinct.

8. LEIOCEPHALUS ERVINGI (Stejneger).

A single adult from Machu Picchu, October 30, 1915 (U.S.N.M. No. 60742).

Stejneger[1] has described what he called *Stenocercus ervingi* from a single very young example. This specimen was only 84 mm. in total length, and the generic characters were difficult or impossible to discern. We have before us a single adult (U.S.N.M. No. 60742), which we believe to be a *Leiocephalus*, owing to the presence of abdominal ribs and of general *Leiocephalus* squamation. It is beyond doubt the adult of Stejneger's species. His type came from Huadquiña, in the Urubamba Valley, only a few miles from Machu Picchu. To supplement Stejneger's description a diagnosis of this adult specimen is added:

Upper head scales of but moderate size, distinctly rugose; nostril superolateral; supranasal separated from the nostril by a row of scales; two rows of distinctly enlarged supra-oculars, separated from the supra-orbital zone series and from the supraciliaries by two or sometimes three series of scales; no well-defined parietals, interparietal or occipitals; a very feebly developed ridge composed of two rows of slightly enlarged serrate scales above the temporal region; four slightly enlarged scales projecting from the anterior border of the ear; sides of neck distinctly folded, covered with rather small strongly imbricate keeled scales; a rather well-developed continuous nuchal and dorsal crest; dorsal scales of medium size, strongly keeled, the keels forming continuous ridges; scales strongly imbricate and slightly mucronate; laterals smaller, less conspicuously keeled; ventrals slightly larger than laterals, smooth; about 70 rows around the middle of the body; scales of the throat and chest smooth; the hind limb being carried forward along the body reaches about the angle of the jaws; tail slightly compressed, with a serrated upper edge most conspicuous at the base. Color olive brown above, with an irregular white line extending along each side from the tympanum to the sacral region; a light line composed of scattered white spots extending from the nose, below the eye, and across the temporal region; a row of white dots on each side of the lower jaw; belly coppery green, with a dark brown spot on each side of the chest extending up over the scapular area, where it is bordered posteriorily with whitish, and a long, more or less rectangular dark brown nearly black spot on the middle and posterior belly area.

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[1] Proc. U. S. Nat. Mus., vol. 45, 1913, p. 542.

Total length, 228 mm.; length of head, 21 mm.; width of head, 17.5 mm.; tip of snout to vent, 84 mm.; fore limb, 35 mm.; hind limb, 62 mm.; tail, 144 mm.

9. LEIOCEPHALUS ARENARIUS (Tschudi).

Four adult specimens from Chospiyoc, Huarocondo River, April 20, 1915 (U.S.N.M. Nos. 60705–8), and one (U.S.N.M. No. 60811) from Toranton, May 1, 1915; also one half-grown specimen (U.S. N.M. No. 60810) from Ollantaytambo, 9,400 feet altitude, May 15, 1915, O. F. Cooke, collector.

Roux[1] has pointed out that *L. rhodogaster* Boulenger[2] is evidently identical with this species. *L. lineigularis* Werner[3] is apparently another synonym. The type localities of *L. rhodogaster* and *L. lineigularis* are very near together, and the descriptions of these species are very similar.

10. TUPINAMBIS NIGROPUNCTATUS Spix.

Two fine adults and one half-grown specimen (U.S.N.M. Nos. 60678–80) from the Comberciato River, 1,800 feet elevation, near the great bend of the Urubamba, September, 1915.

11. KENTROPYX CALCARATUS Spix.

One mutilated specimen (U.S N.M. No. 60744) from the same locality as the specimens of Tupinambis and taken about the same time.

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[1] Rev. Suisse Zool., vol. 15, No. 2, 1907, p. 300.

[2] Ann. Mag. Nat. Hist., ser. 7, vol. 7, 1901, p. 546.

[3] Abh. Mus. Dresden, vol. 9, 1901, p. 3.

This specimen may possibly be referable to *K. pelviceps* Cope, but the head and throat are so badly damaged that it is impossible to determine.

12. AMEIVA AMEIVA PETERSII (Cope).

Eight specimens mostly adults (U.S.N.M. Nos. 60685–91) from Santa Ana, 3,400 feet altitude.

These specimens are typical of this race as recently defined.[1] The occurrence of these specimens in the Urubamba Valley considerably extends the lizard's range.

13. PRIONODACTYLUS SPINALIS Boulenger.

Two specimens (U.S.N.M. Nos. 60729–30) from Ollantaytambo, July 14, 1915; one (U.S.N.M. No. 60745) from the Cosireni River, August, 1915; and 15 (U.S.N.M. Nos. 60663–77) from Tocopoqueyu in the Occobamba River Valley, July 25, 1915.

Two paratypes[2] of this species are before us. They fall well within the range of variation of scutation exhibited in this series of 18 specimens collected by the expedition. The smaller of the paratypes is, however, somewhat different from any of these specimens. In addition to the vertebral stripe, there is a dorso-lateral stripe of light gray on each side of the back. In all but one of our specimens the vertebral stripe is faintly indicated and the other two stripes are entirely wanting. This difference of coloration may be a constant feature, and our specimens may represent a distinct geographical race of *Prionodactylus spinalis* in southern Peru. But in view of the absence of any definite anatomical character, we do not feel justified in describing it.

The type locality of *Prionodactylus spinalis* is given in the original description as Huancabamba, Peru. Doctor Boulenger has informed us by letter that this was probably an error and that the specimens may have come from Oxapampa. If they came from Huancabamba, it was certainly from the Huancabamba of central but not that of northern Peru.

Oxapampa (also spelled Oxabamba) is on the Rio Huancabamba, a small tributary of the Rio Palcazu, about 40 miles east-northeast of Cerro de Pasco. There are two towns named Huancabamba in Peru—one a little village on the Rio Huancabamba, mentioned above, and the other a town in the Department of Piura.

14. OREOSAURUS ANOMALUS, new species.

Diagnostic characters.—Habit and coloration similar to *Oreosaurus ocellifer* Boulenger; scutation somewhat the same, but differing in the following striking features: A pair of supranasals separating the nasals and broadly in contact; 32 scales from the occiput to the base of the tail; 36 scales around the middle of the back, including ventrals; ventrals squarish in 10 longitudinal and 17 transverse rows.

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[1] Barbour and Noble, Bull. Mus. Comp. Zoöl., vol. 59, No. 6, 1915, p. 466.

[2] Mus. Comp. Zool., No. 8082, and Amer. Mus. Nat. Hist., No. 5280.

Range.—Valley of the San Miguel River, southern Peru.

Type-specimen.—Cat. No. 60704, U.S.N.M., San Fernando, 4,500 feet, Rio San Miguel, southern Peru; October, 1915; E. Heller, collector.

Description of type specimen.—Adult male: Head short, body and limbs moderate; a pair of supranasals separating the nasals and broadly in contact; frontonasal pentagonal longer than broad; frontal pentagonal, the point directed backward being very obtuse; interparietal slightly longer than parietals, about once and a half as long as frontoparietals, distinctly longer than the frontal; three occipitals, the lateral ones as large as the largest supraoculars, the median one about one-fifth as large as either; three supraoculars; a row of supraciliaries increasing in size anteriorly, the most anterior very large and simulating a fourth supraocular; no loreal; a single row of infraorbitals; temporals large; 8 upper and 7 lower labials; 1 anterior unpaired chin shield followed by 3 pairs in contact; 8 transverse rows of scales and 1 row of granules between chin shields and posterior edge of the collar, the granules between the first and second rows of scales; 12 scales in the collar; dorsal scales elongate, keeled, more than twice as long as broad; lateral scales decreasing rapidly in size from above; a row of smaller scales, interpolated between each of the lateral rows; 32 scale rows from the occiput to the base of the tail; 36 scale rows around the middle of the body, ventrals included; ventrals rectangular, nearly square, in 10 longitudinal and 17 transverse rows; 6 preanal scales, 3 posterior ones preceded by a pair of which 1 scale is divided transversely to make the sixth scale; 7 femoral pores on one side, 8 on the other; tail about once and a half as long as the body, the scales like those of the body. Color (in alcohol) above dark ashy brown, tinged with reddish brown on the head and back, a yellow stripe indistinctly bordered with dark brown running from the eye across the temporal region and fading out on the neck, a few black specks on the head and back; a series of 8 black ocelli with small white centers on one side of the body, 12 on the other; ventral surface uniform yellowish white, a few black specks on the labials, chin-shields, and outer edge of the ventral surface.

Total length, 119 mm.; tip of snout to vent, 39 mm.; vent to tip of tail, 80 mm.; tip of snout to ear, 8 mm.; width of head, 5 mm.; fore leg, 8.5 mm.; hind leg, 13 mm.

Remarks.—This species is represented in the collection by the type only. The most striking peculiarity of the species is the pair of supranasals, which do not occur in any other species of *Oreosaurus* nor in the closely related genus *Proctoporus*. These scales are very regular in outline. The surrounding scales are in perfectly normal position, which condition leads us to believe that these scales are perfectly normal.

15. OREOSAURUS LACERTUS Stejneger.

Two specimens (U.S.N.M. Nos. 60699–700) collected by Erdis at Ñusta Hispaña, June 11, 1915; two (U.S.N.M. Nos. 60719–20) by O. F. Cook at Ollantaytambo, May 15, 1915; one (U.S.N.M. No. 60746) from the same locality, July 14, 1915, and two (U.S.N.M. Nos. 60726–7) from Torontay, May 10, 1915, by Heller.

16. PROCTOPORUS OBESUS, new species.

Diagnostic characters.—A loreal widely separated from the supralabials by the freno-orbital and nasal which are in broad contact; one anterior unpaired chin shield followed by three pairs in contact; dorsal scales elongate, smooth, in 24 transverse rows; ventral scales in 12 longitudinal rows.

Range.—Region of Ñusta Hispaña, southern Peru.

Type specimen.—Cat. No. 60748 U.S.N.M.; Ñusta Hispaña, southern Peru, June 11, 1915; E. C. Erdis, collector.

Description of type specimen.—Adult male: Head short, body stout, limbs moderate; frontonasal much longer than broad, slightly longer than the frontal; frontal hexagonal; interparietal distinctly longer than parietals, slightly narrower, once and a half as long as frontal; three occipitals, the lateral ones much larger than the largest supraocular; the median one about one-fifth as large as either; three supraciliaries, the anterior one as large as the anterior supraocular; a loreal widely separated from the supralabials by the freno-orbital and nasal which are in broad contact; a single row of large infraorbitals; temporals large; eight upper and six lower labials; one anterior unpaired chin shield followed by three pairs in contact; 10 transverse rows of scales between chin-shields and collar, including the latter; nine collar scales; dorsal scales elongate, quadrangular, smooth, juxtoposed; in the middle of the body just twice as long as broad; scales on the upper part of the sides equal in size to the dorsals; these scales gradually and only slightly decreasing in size on the lower flanks; a series of very small scales interpolated between each of the lateral rows from the point where they join the ventrals for a short distance upward, these small scales sometimes hidden in a longitudinal fold; about 44 scales from occiput to base of the tail, 36 around the middle of the body, including the ventrals; ventral plates quadrangular, nearly square, in 12 longitudinal and 21 transverse series; two anterior preanals followed by four smaller marginal ones; four femoral pores on each side; tail stout, the scales similar to those of the body. Color (in alcohol) above uniform pinkish brown, the outer edges of the scales lighter than the inner edges; dorsal color fading out on the sides; ventral surface uniform dull cream color.

Total length, 152 mm.; tip of snout to vent, 78 mm.; vent to tip of tail (regenerated), 74 mm.; tip of snout to ear, 18 mm.; width of head, 13 mm.; fore leg, 15.5 mm.; hind leg, 23 mm.

Remarks.—The type is the only representative of the species in the collection. It was evidently caught in a mouse trap, for it is badly damaged, still the scutation is not seriously injured. There can be no doubt as to the distinctness of the species.

Suborder SERPENTES.

17. BOA HORTULANA Linnaeus.

One young (U.S.N.M. No. 60694) from Rio Cosireni, 3,000 feet altitude, and one adult (U.S.N.M. No. 60693, skin only) from Rio Comberciato, 2,000 feet altitude.

18. DRYMOBIUS BODDAERTI (Sentzen).

One young specimen (U.S.N.M. No. 60716) from San Fernando, Rio Corsireni, October 15, 1915.

19. PHRYNONAX FASCIATUS (Peters).

One fine adult (U.S.N.M. No. 60696) from Paltaybamba, 6,000 feet altitude, August, 1915.

20. SPILOTES PULLATUS (Linnaeus).

Two enormous but badly shot adults (U.S.N.M. Nos. 60661–2) from Santa Ana in the Urubamba Valley, 3,400 feet elevation, December, 1914.

21. DRYMARCHON CORAIS CORAIS (Boie).

One young specimen (U.S.N.M No. 60749) collected by Erdis, at Santa Ana, 3,900 feet altitude, December, 1914, and one large adult (U.S.N.M. No. 60660) by Heller, October, 1915, same locality, but 500 feet lower.

22. HERPETODRYAS FUSCUS (Linnaeus).

One adult (U.S.N.M. No. 60695) from Paltaybamba, 6,000 feet altitude, August, 1915.

23. ATRACTUS PERUVIANUS (Jan).

One specimen (U.S.N.M. No. 60717) from Pucyura, 9,500 feet altitude, June 15, 1915; E. C. Erdis, collector.

This is the species which Ruthven and Barbour called *A. badius* in 1913.[1] It is apparently not typical of either species, to judge by figures and descriptions only. At present, until authentic material is available for comparison, it may perhaps better remain under this caption.

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[1] Proc. Acad. Nat. Sci., Philadelphia, 1913, p. 505.

24. LEPTODEIRA ANNULATA (Linnaeus).

One adult (U.S.N.M. No. 60736) from the San Miguel Bridge, near the ruins of Machu Picchu, in the Urubamba Valley, July 2, 1915.

25. CLELIA PETOLA SEMIFASCIATA (Tschudi).

One adult (U.S.N.M. No. 60684) from San Fernando, Cosireni River.

26. CLELIA CLOELIA (Daudin).

One specimen (U.S.N.M. No. 60747) from Paltaybamba, 6,000 feet elevation, June 15, 1915; collected by E. C. Erdis.

27. TACHYMENIS PERUVIANA (Wiegmann).

Two adults from Chospiyoc, 10,000 feet altitude, on the Huarocondo River, April 20, 1915; five other specimens (U.S.N.M. Nos. 60722–4 and 60697–8) from the same region, at about 11,000 feet elevation; another adult (U.S.N.M. No. 60721) from Cedrobamba ruins, at timber line, 12,000 feet altitude, June 15, 1915; and another (U.S.N.M. No. 60743) from Ollantaytambo, 9,400 feet, July 14, 1915; all collected by E. Heller. Three adults (U.S.N.M. Nos. 60681–3) from Pucyura, 9,500 feet collected by E. C. Erdis, June 15, 1915.

This large series shows conclusively that *Leimadophis andicolus* Barbour[1] is identical with *Tachymenis peruviana.* In some of the specimens before us, such as the type of *L. andicolus*, the grooves in the enlarged posterior teeth are very far from distinct. A similar condition occurs in *Coniophanes imperialis* and *Erythrolamprus aesculapii.* This suggests that the presence or absence of grooves in the posterior teeth where the dentition is otherwise the same has been greatly exaggerated as a taxonomic character, and we believe that under the present system of classification many closely related genera of snakes are often widely separated into different series by a character of very trivial importance.

28. ERYTHROLAMPRUS AESCULAPII TETRAZONA (Jan).

One adult (U.S.N.M. No. 60728) from Yuveni, Rio Cosireni, August, 1915.

29. DREPANODON ERDISII Barbour.

One specimen (U.S.N.M. No. 60702), a topotype from Machu Picchu, Urubamba Valley, at the San Miguel Bridge, July 2, 1915.

30. DREPANODON EATONI Ruthven.

Another adult specimen (U.S.N.M. No. 60703), with data exactly the same as its foregoing congener.

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[1] Proc. Biol. Soc. Washington, vol. 28, 1915, p. 140.

31. DREPANODON ATTENUATUS, new species.

Diagnostic characters.—Scales smooth, in 19 rows; no apical pits; ventrals 229, rounded; subcaudals in 105 pairs; loreal smaller than the preocular, but nearly as large as the posterior nasal.

Range.—Cosireni River Valley, Peru.

Type-specimen.—Cat. No. 60739, U.S.N.M.; from the alimentary tract of a specimen of *Erythrolamprus aesculapii*, taken near Rio Cosireni, Peru, August, 1915; E. Heller, collector.

Description of type specimen.—About 10 small maxillary teeth, subequal (the jaws were somewhat smashed), followed after a short interspace by two somewhat enlarged and distinctly grooved teeth; head scarcely distinct from the neck; eye moderate with vertically eliptical pupil; body slightly compressed; scales smooth, in 19 rows; no apical pits; ventrals 229, rounded; anal undivided; subcaudals in 105 pairs; rostral broader than high, just visible from above; nostril in the suture between two nasals; frontal longer than broad; loreal smaller than the preocular, but nearly as large as the posterior nasal; loreal elongate, forming a rectangle; one preocular and two postoculars; temporals 2–4–3; seven and eight upper labials, of which the third and fourth on one side, and the third, fourth, and fifth on the other enter the eye; four lower labials in contact with the anterior chin-shields, which are about equal in length to the posterior pair. Color (in alcohol) of the head, above and on the sides, black, each scale edged with white, and pinkish below; ground color of the body pinkish; 64 black annuli encircling the body, of very irregular outline, the scales forming the edges being generally entirely black; scattered black spots present on the tips of some of the scales of the pink interspace; these light rings generally wider below than above; more black on the sides of the body than above; 16 of the black bands encircling the tail, tip black.

Remarks.—This species is represented by a single specimen. The occurrence of still another species of *Drepanodon*[1] in the Urubamba Region would lead us to suppose that these night-prowling snakes are much more numerous than generally recorded.

32. MICRURUS HETEROZONUS (Peters).

A single specimen (U.S.N.M. No. 60701) of this rare species[2] from Cosireni, 4,000 feet altitude, September 10, 1915; Heller collector.

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[1] Barbour, Proc. Acad. Nat. Sci. Philadelphia, 1913, pp. 505–507, pl. 17.

[2] For use of *Micrurus* instead of *Elaps* see Stejneger and Barbour, Check List N. Amer. Amph. Rept., 1917, p. 106.

33. SIBYNOMORPHUS CATESBEJI (Sentzen).

A single specimen (U.S.N.M. No. 60734) of this wide-ranging species from the Comberciato River, 1,800 feet, near the great bend of the Urubamba.

34. SIBYNOMORPHUS PERUANUS (Boettger).

One specimen (U.S.N.M. No. 60718) from Pucyura, 9,500 feet, June, 1915; E. C. Erdis.

35. BOTHROPS PICTUS (Tschudi).

Two specimens (U.S.N.M. Nos. 60714–5), from the Cosireni River. This form is probably a local race of *B. lanceolatus*, and as such should have a trinominal designation. Future work will probably show that it replaces *B. lanceolatus* in portions of central and southern Peru, its distribution being perhaps correlated with altitudes, although the Museum of Comparative Zoology has a specimen from Lima, which is practically at sea level. It is, however, on the Pacific coast, and *B. lanceolatus* may be confined, except in Ecuador, to the montaña region.

GENOTYPES OF THE ELATERID BEETLES OF THE WORLD.

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INTRODUCTION.

The following paper is a catalogue of the genera of the Elateridae of the world, designating the type species of each genus. Those who have attempted taxonomic work in a biological complex of the magnitude of the Elateridae, over 6,000 species for which about 600 generic names have been proposed, appreciate the function of genotype fixation and recognize the value of collecting this information in the form of a genotype list as a foundation work in the taxonomic study of such a complex.

The failure to recognize types of the several genera has led to the present extreme confusion in the literature on the Elateridae. For example, the genus *Elater*, as recognized by contemporary coleopterists, is in reality the genus *Ampedus*, the insects now recognized under the generic name *Ludius* being truly *Elater*. *Ludius*, on the other hand, should be applied to the insects generally known as *Corymbites*, and *Corymbites*, as a generic name, disappears. The two genera *Adelocera* and *Lacon* have been reversed in their application, etc.

After the separation from the Linnean genus *Elater*, of *Melasis* by Olivier, *Eucnemis* by Ahrens, *Pyrophorus* by Illiger, and *Cebrio*, *Cerophytum*, and *Hammonius* by Latreille, the first writer to attempt a division of this complex was Eschscholtz, who published his work in Thon's Entomologisches Archiv,[1] a work that is extremely rare in this country. He was followed by Laporte de Castelnau, Latreille, Germar, Erichson, LeConte, Horn, and the greatest monographer of this family, Ernest Candèze.

The first to attempt a definite fixation of types in this group is Westwood in the appendix to The Modern Classification of Insects, 1840. E. Blanchard, fixed types in Histoire Naturelle des Insectes in 1873. Two of the most important papers fixing Elaterid genotypes are those of Thompson, Scandinavian Coleoptera, 1859, and Reitter in Bestimmung, Tabelle, 1905. Other writers from time to time have incidentally indicated the type of polybasic genera, and the more recent writers have often indicated the types of genera erected by themselves.

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[1] Vol. 2, pt. 1, 1829.

This catalogue presumes to be complete up to January 1, 1919, and omissions and corrections will be gratefully received. The genera erected for fossil species are included in the general catalogue and are indicated by footnotes. The arrangement is strictly alphabetical, each genus being printed in heavy type, and followed by the name of the author. Generic names that are not valid are set off by brackets. Prior use of the same name is indicated by the name of the author previously using the name and the date of publication, following the present citation. If the name was used in some family other than the Elateridae, this use is indicated. Thus **Oxysternus** LATREILLE, not GODET 1833, Histeridae, means that the Elaterid generic name *Oxysternus* used by Latreille had been previously used in 1833 by Godet for a genus of Histeridae. The second line is the date of publication of the name of the genus under consideration, followed by the bibliographical reference and the number of species originally included. Where genera are erected without species and later valid species included, the bibliographical reference to the original description and also to the publication in which the first species are included in this genus are both given. This has been done in order to make this work acceptable to both those who accept genera without species and to those who do not. When isogenotypic synonymy occurs, this is indicated in a note. The genotype is italicized and the rule followed in selecting the type is indicated in parentheses. The bibliographical reference following the genotype is to the publication in which the species was described as recognized by the author of the genus. In many cases an author refers to a species as described by Fabricius, while the species was originally described by Linnaeus; but as this involves synonymical reference the Fabrician description and the insect to which it applies is recognized as the type of the genus.

In selecting these types the author has strictly followed the rules of the International Zoological Congress. In the more minute details the code as prepared by Messrs. Banks and Caudell has been followed, and the writer wished to express his appreciation of the kind assistance given by both of these gentlemen in interpreting nomenclatorial codes. At the end of the paper the genotypes are arranged alphabetically to facilitate the selecting of types for new genera. The writer has examined the descriptions of all the genera. No attempt has been made to discuss generic synonymy except where such synonymy is directly due to isogenotypic, or where a name preoccupied has since been referred to synonymy under some other genus. In this latter case the type given is for the preoccupied genus and not the genus to which it is now referred. Where possible a species not subsequently cited in synonymy nor referred to another genus was selected, and where no other criterion was available, the most common species originally included was selected.

The writer wishes to express his sincere appreciation of the invaluable assistance given in locating literature and deciding doubtful cases by Mr. E. A. Schwarz, of the United States National Museum, and that of Miss Mabel Colcord, librarian of the Bureau of Entomology, in the use of the library facilities in Washington.

GENOTYPES OF THE ELATERIDAE.

Acanthathous CHAMPION.

1895, Biol. Centr. Amer., Col., vol. 3, p. 462, pl. 20, fig. 17.

Type.—*Acanthathous pachyderoides* CHAMPION (Monobasic).

Achrestus CANDÈZE=(**Anepsius** CANDÈZE not LECONTE 1852).

1869, Harold's Col, Heft, vol. 5, p. 122. New name for *Anepsius* CANDÈZE preoccupied.

Type.—*Anepsius flavocinctus* CANDÈZE.

Acrocryptus CANDÈZE (=**Cryptotarsus** PHILIPPI not KIRSCH 1865)=(**Apocryptus** (CANDÈZE) SHARP, typ. err., 1874).

1874, Revis, Mono. Elat., vol. 1, p. 39. New name for *Cryptotarsus* PHILIPPI, preoccupied.

Type.—*Cryptotarsus ater* PHILIPPI.

Acroniopus ERICHSON=(**Atelopus** ERICHSON not DUMERIL, 1840).

1843, Wiegm. Arch. f. Naturg., vol. 2, p. 175. New name for *Atelopus* ERICHSON, preoccupied.

Type.—*Atelopus humilis* ERICHSON.

Actenicerus KIESENWETTER.

1861, Naturg. d. Ins. Deutschl., vol. 4, p. 285.

Type.—*Corymbites tesselatus* GERMAR, Zeit. f. d. Ent., vol. 4, p. 62, 1843 (Monobasic).

NOTE.—Germar (1843) credits this species to Linnaeus. Candèze (1863) reduces *C. tesselatus* GERMAR to synonymy under *C. tesselatus* LINNAEUS, also referring *A. tesselatus* KIESENWETTER to synonymy under this species. O. Schwarz (1906) reduces the genus to synonymy under *Ludius* LATREILLE.

Adelocera LATREILLE.

1829, Cuvier's Regne Anim., vol. 4, p. 451, two species.

Type.—*Elater ovalis* GERMAR, Ins. Sp. Nov., p. 49, 1824. (Present designation.)

NOTE.—*E. fasciatus* LINNAEUS designated by Thomson, Skand., Col., vol. 1, p. 103, 1859, was not originally included. *E. fuscus* FABRICIUS, the other originally included species, is now referred to *Melanotus* ESCHSCHOLTZ by Gemminger and Harold, 1869. Candèze (1857) refers the type to the genus *Lacon* LAPORTE.

Adiaphorus CANDÈZE.

1859, Monogr. Elat., vol. 2, p. 47. Two species.

Type.—*Adiaphorus gracilicornis* CANDÈZE. (Present designation.)

Adolesches Candèze.
1881, Elat. Nouv., fasc. 3, p. 107.
Type.—*Adolesches crinitus* Candèze (Monobasic).

Adrastus (Megerle) Eschscholtz.
1829, Thon. Arch., vol. 2, pt. 1, p. 35.
Type.—*Elater limbatus* Fabricius, Gen. Ins., p. 235, 1777. (Monobasic.)

[**Aelius** (Candèze) Sharp emend.]=**Elius** Candèze.
1889, Zool. Record, p. 132.
Type.—*Elius prionocerus* Candèze.

Aemidius Latreille.
1834, Ann. Soc. Ent. France, vol. 3, p. 157.
Type.—*Eucnemis gigas* Mannerheim, Monogr. Eucn., p. 14, 1823. (Monobasic.)

Aeoloides Schwarz.
1906, Gen. Ins., fasc. 46, p. 109. Seven species.
Type.—*Heteroderes sequester* Candèze, Mongr. Elat., vol. 2, p. 378, 1859 (Present designation.)

Aeolus Eschscholtz.
1829, Thon. Arch., vol. 2, pt. 1, p. 33. Two species.
Type.—*Elater scriptus* Fabricius, Syst. Eleuth., vol. 2, p. 244, 1801. (Present designation.)
Note.—*Aeolus crucifer* Rossi [type by designation of Gozis (Recher. Esp. Typ., p. 22, 1886) was not originally included].

Agelasinus Candèze.
1863, Monogr. Elat., vol. 4, p. 335. Two species.
Type.—*Agelasinus viridis* Candèze. (Present designation.)

Aglophus Sharp.
1877, Ann. Mag. Nat. Hist., ser. 4, vol. 19, No. 113, p. 409.
Type.—*Aglophus modestus* Sharp (Monobasic).

Agonischius Candèze.
1863, Monogr. Elat., vol. 4, p. 407. Twenty-six species.
Type.—*Agonischius pectoralis* Candèze. (Present designation.)

Agraeus Candèze.
1857, Monogr. Elat., vol. 1, p. 165.
Type.—*Agraeus mannerheimii* Candèze (Monobasic).

Agriotes Eschscholtz.
1829, Thon. Arch., vol. 2, pt. 1, p. 34. Seven species.
Type.—*Elater sputator* Linnaeus, Syst. Nat., ed. 10, p. 405, 1758. (Designation of Westwood, Int. Mod. Class. Ins., vol. 2, Gen. Syn., p. 25, 1840.)

Agriotides Schwarz.
1906, Gen. Ins., fasc. 46, p. 273. Three species.
Type.—*Agonischius mutabilis* Schwarz, Deut. Ent. Zeit., p. 153, 1898. (Present designation.)

Agrypnella Champion.
1895, Biol. Centr. Amer., Col., vol. 3, p. 414. Two species.
Type.—*Agrypnella eburnea* Champion. (Present designation.)

Agrypnus Eschscholtz.
1829, Thon. Arch., vol. 2, pt. 1, p. 32. Twelve species.
Type.—*Elater tomentosus* Fabricius, Ent. Syst., Suppl., p. 138, 1798. (Present designation.)

Alampes Champion.
1896, Biol. Centr. Amer., Col., vol. 3, p. 474. Three species.
Type.—*Alampes vestitus* Champion. (Present designation.)

Alampoides Schwarz.

1906, Gen. Ins., fasc. 46, p. 216. Four species.

Type.—*Pyrophorus submaculatus* Schwarz, Stett. Ent. Zeit., p. 284, 1902. (Present designation.)

Alaolacon Candèze.

1865, Elat. Nouv., fasc. 1, p. 13.

Type.—*Alaolacon cyanipennis* Candèze. (Monobasic.)

Alaomorphus Hauser.

1900, Deut. Ent. Zeit., p. 141.

Type.—*Alaomorphus candezei* Hauser. (Monobasic.)

Alaotypus Schwarz.

1902, Deut. Ent. Zeit., p. 307. Two species.

Type.—*Alaotypus subpectinatus* Schwarz. (Present designation.)

Alaus Eschscholtz.

1829, Thon. Arch., vol 2, pt. 1, p. 32. Two species.

Type.—*Elater oculatus* Fabricius, Ent. Syst., vol. 2, p. 210, 1775. (Present designation.)

Note.—Fabricius refers to this as a Linnean species, and it is so considered by all subsequent authors; therefore, *E. oculatus* Linnaeus, Syst. Nat., ed. 10, p. 404, 1758, is the actual type.

Alcimathous Reitter.

1905, Bestim. Tab., Heft 56, pp. 32, 42.

Type.—*Athous sacheri* Kiesenwetter, Naturg. d. Ins. Deutschl., vol. 4, pt. 2, p. 320, 1860 (Monobasic).

Note.—Reitter (1905) describes this genus as a subgenus of *Athous* Eschscholtz.

Aliteus Candèze.

1857, Monogr. Elat., vol 1, p. 197. Two species.

Type.—*Alaus reichei* (Dejean) Candèze. (Present designation.)

Note.—Dejean (1833) mentions this species in his catalogue where it is evidently a manuscript name.

Allotriopsis Champion.

1896, Biol. Centr. Amer., Col., vol. 3, p. 489.

Type.—*Allotriopsis nasalis* Chamion (Monobasic).

[**Allotrius** Laporte de Castelnau, not Temminck 1835, Aves.]=**Senodonia** Castelnau.

1840, Hist. Nat. Anim. Artic., Col., vol. 1, p. 231.

Type.—*Semiotus* (*Senodonia*) *quadricollis* Castelnau, Silb. Rev., vol. 4, p. 12, 1836 (Monobasic).

Note.—Isogenotypic with *Senodonia* Castelnau, 1836.

[**Amaurus** Laporte de Castelnau, not Burmeister 1835, Hemiptera.]=**Agrypnus** Eschscholtz.

1840, Hist. Nat. Anim. Artic., Col., vol. 1, p. 237. Three species.

Type.—*Amaurus senegalensis* Castelnau. (Present designation.)

Note.—Candèze (1857) reduces the genus to synonymy under *Agrypnus* Eschscholtz and reduces the type to synonymy under *Agrypnus* (*Elater*) *notodonta* Latreille.

[**Amblygnathus** Solier, not Dejean 1829, Carabidae.]=**Neotrichophorus** Jacobs.

1851, Gay Hist. fis. Chile, Zool., vol. 5, p. 36.

Type.—*Amblygnathus abdominalis* Solier (Monobasic).

Note.—Candèze (1863) reduces the genus to synonymy under *Ludius* Latreille and type to synonymy under *Ludius* (*Genomecus*) *ruficollis* Solier. O. Schwarz (1906) reduces the type to synonymy under *Trichophorus ruficollis* Solier.

Ampedus (Megerle) DEJEAN.

1833, Cat., ed. 3, p. 92. Thirty-eight species.

Type.—*Elater sanguineus* FABRICIUS, Syst. Eleuth., vol. 2, p. 338, 1801. (Designation of Gozis, Recher. Esp. Typ., p. 22, 1886.)

NOTE.—Candèze (1859) reduces the genus to synonymy under *Elater* LINNAEUS and the type to synonymy under *Elater sanguineus* LINNAEUS. Gemminger and Harold (1869) reduce the type to synonymy under *Elater lythropterus* GERMAR.

[**Amphiplatys** (Sharp) CANDÈZE emend.]=**Amphyplatys** SHARP.

1891, Cat. Method., p. 119.

Type.—*Amphyplatys lawsoni* SHARP.

Amphyplatys SHARP.

1877, Ann. Mag. Nat. Hist., ser. 4 vol. 19, No. 113, p. 406.

Type.—*Amphyplatys lawsoni* SHARP. (Monobasic.)

Amychus PASCOE.

1876, Ann. Mag. Nat. Hist., ser. 4, vol. 17, p. 49.

Type.—*Amychus candezei* PASCOE. (Monobasic.)

Anacantha SOLIER.

1851, Gay Hist. fis. Chile, Zool., vol. 5, p. 18.

Type.—*Anacantha sulcicollis* SOLIER. (Monobasic.)

Anaissus CANDÈZE.

1857, Monogr. Elat., vol. 1, p. 187.

Type.—*Anaissus tarsalis* CANDÈZE. (Monobasic.)

Anamesus LECONTE.

1866, Proc. Acad. Nat. Sci. Philad., vol. 18, p. 393.

Type.—*Anamesus convexicollis* LECONTE. (Monobasic.)

Anaspasis CANDÈZE.

1881, Elat. Nouv., fasc. 3, p. 4.

Type.—*Anaspasis fasciolata* CANDÈZE. (Monobasic.)

NOTE.—O. Schwarz (1906) reduces the type, which he misspells *fasciculata*, to synonymy under *A. parellela* SOLIER.

Anathesis CANDÈZE=(Candezia DEYROLLE, nomen nudum 1864.)

1865, Elat. Nouv., fasc. 1, p. 21.

Type.—*Anathesis laconoides* CANDÈZE. (Monobasic.)

[**Anathratus** (Stephens) SCHWARZ, typ. err.]=**Anathrotus** STEPHENS.

1906, Gen. Ins., fasc. 46, p. 204.

Type.—*Athous subfuscus* MÜLLER.

NOTE.—O. Schwarz, Gen. Ins., fasc. 46, p. 322, 1906, corrects this mistake.

Anathrotus STEPHENS=(Anathratus (Stephens) SCHWARZ, typ. err.).

1830, Ill. Brit. Ent., Mand., vol. 3, p. 273. Ten species.

Type.—*Athous subfuscus* MÜLLER, Faun. Fridr., p. 17, 1767. (Designation Reitter, Bestim. Tab., Heft 56, p. 33, 1905.)

NOTE.—*Elater analis* FABRICIUS, Ent. Syst., vol. 1, 1775. (Designation of Thomson, Skand. Col., vol. 1, p. 105, 1859), not originally included. Stephens (1830) credits this type to Gyllenhal.

The reference made by Stephens to Dillwyn as the author of the genus is not tenable, as it refers to a set of unpublished "Memoranda relating to Coleopterous insects found in the neighborhood of Swansea, 1829." Candèze (1860) reduces the genus to synonymy under *Athous* ESCHSCHOLTZ, and reduces *Athous subfuscus* STEPHENS to synonymy under *Athous vittatus* FABRICIUS, but recognizes *Athous subfuscus* MÜLLER as valid.

Anchastomorphus CHAMPION.

1895, Biol. Centr. Amer., Col., vol. 3, p. 399. Fourteen species.
Type.—*Anchastomorphus quadriguttatus* CHAMPION. (Present designation.)

Anchastus LECONTE.

1853, Trans. Amer. Philos. Soc., vol. 10, p. 459. Two species.
Type.—*Anchastus digitatus* LECONTE. (Present designation.)

Anchylocheira[1] GIEBEL.

1856, Ins. Vorw., p. 83.
Type.—*Anchylocheira teleas* GIEBEL. (Monobasic.)

Anepismus[1] HANDLIRSCH.

1906, Die Fossilen Insect, vol. 1, p. 450, pl. 41, fig. 53.
Type.—*Elater vanus* GIEBEL, Ins. Vorwelt, p. 92, 1856. (Monobasic.)

NOTE.—Handlirsch says: "Gehört wohl kaum zu den Elateriden."

[**Anepsius** CANDÈZE, not LECONTE, 1852, Tenebrionidae, not LOEW, 1857, Diptera]=**Achrestus** CANDÈZE.

1859, Monogr. Elat., vol. 2, p. 156. Four species.
Type.—*Anepsius flavocinctus* CANDÈZE. (Present designation.)

NOTE.—Gemminger and Harold (1869) and O. Schwarz (1906) reduce this genus to synonymy under *Achrestus* CANDÈZE.

Anilicoides CANDÈZE.

1893, Elat. Nouv., fasc. 5, p. 52.
Type.—*Anilicoides depressus* CANDÈZE. (Monobasic.)

Anilicopsis SCHWARZ.

1906, Gen. Ins., fasc. 46, p. 284.
Type.—*Dicteniphorus dubius* SCHWARZ, Deut. Ent. Zeit., p. 397, 1903. (Monobasic).

Anilicus CANDÈZE.

1863, Monogr. Elat., vol. 4, p. 328. Three species.
Type.—*Anilicus attenuatus* CANDÈZE. (Present designation.)

Anisomerus SCHWARZ.

1897, Deut. Ent. Zeit., p. 13. Five species.
Type.—*Dicronychus bipectinatus* SCHWARZ, Deut. Ent. Zeit., p. 94, 1896 (Present designation).

NOTE.—O. Schwarz (1906) refers this genus to his new family Dicronychidae.

Anius CANDÈZE.

1889, Elat. Nouv., fasc. 4, p. 37 (103).
Type.—*Anius gracillimus* CANDÈZE. (Monobasic.)

Anoplischiopsis CHAMPION.

1895, Biol. Centr. Amer., Col., vol. 3, p. 301. Seven species.
Type.—*Anoplischiopsis bivittatus* CHAMPION. (Present designation.)

Anoplischius CANDÈZE.

1859, Monogr. Elat., vol. 2, p. 49. Forty-one species.
Type.—*Anoplischius pallidipes* CANDÈZE. (Present designation.)

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[1] Fossil.

Anostirus Thomson.

1859, Skand. Col., vol. 1, p. 103.

Type.—*Elater castaneus* Linnaeus, Syst. Nat., vol. 2, p. 654, 1740 (Monobasic).

Note.—Candèze (1863) and Gemminger and Harold (1869) refer the type to *Corymbites* Latreille.

Anthracalaus Fairmaire.

1888, Ann. Soc. Ent. France, ser. 6, vol. 8, p. 349. Two species.

Type.—*Alaus westermanni* Candèze, Monogr. Elat., vol. 1, p. 216, 1857 (Original designation).

Anthracopteryx Horn.

1891, Trans. Amer. Ent. Soc., vol. 18, p. 30.

Type.—*Anthracopteryx hiemalis* Horn. (Monobasic.)

Antitypus Candèze.

1881, Elat. Nouv., fasc. 3, p. 70.

Type.—*Elater insignitus* Fairmaire, Rev. Zool., p. 268, 1860. (Monobasic.)

Aphanobius Eschscholtz.

1829, Thon. Arch., vol. 2, pt. 1, p. 33. Three species.

Type.—*Aphanobius longicollis* Eschscholtz (by designation of Candèze, Monogr. Elat., vol. 4, p. 322, 1863).

Note.—*Aphanobius infuscatus* Germar designated as genotype by Le-Conte, Trans. Amer. Philos. Soc., vol. 10, p. 453, 1853, was not originally included in the genus.

Aphileus Candèze.

1857, Monogr. Elat., vol. 1, p. 184. Two species.

Type.—*Aphileus lucanoides* Candèze. (Present designation.)

[**Aphodistus** (Kirby) Agassiz, typ. err.]=**Aphotistus** Kirby.

1846, Nom. Zool., p. 13.

Type.—*Elater aeneus* Linnaeus.

Aphotistus Kirby (=**Aphodistus** (Kirby) Agassiz, typ. err.).

1837, Fauna Bor. Amer., p. 149.

Type.—*Elater aeneus* Linnaeus, Syst. Nat., ed. 10, p. 406, 1758. (Original designation.)

Note.—Candèze (1863) and Gemminger and Harold (1869) reduce this genus to synonymy under *Corymbites* Latreille.

Aphricus LeConte.

1853, Trans. Amer. Philos. Soc., vol. 10, p. 501.

Type.—*Aphricus californicus* LeConte. (Monobasic.)

Apistotes[1] Handlirsch.

1906, Die Fossilen Insect., vol. 1, p. 559, pl. 45, fig. 59.

Type.—*Elater purbeccensis* Giebel, Ins. Vorw., p. 92, 1856. (Monobasic.)

Aplastus LeConte.

1859, Proc. Acad. Nat. Sci. Philad., Cat. Col. Fort Tejon, Calif., p. 72.

Type.—*Aplastus speratus* LeConte. (Monobasic.)

Aplotarsus Stephens=(**Haplotarsus** Scudder emend.).

1830, Ill. Brit. Ent. Mand., vol. 3, p. 271. Four species.

Type.—*Elater rufipes* Fabricius (Designation of Westwood, Int. Mod. Class. Ins., vol. 3, Gen. Syn., p. 25, 1840).

Note.—Gemminger and Harold reduce the genus to synonymy under *Corymbites* Latreille, and the species *rufipes* Stephens to synonymy under *Corymbites quercus* Olivier.

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[1] Fossil.

Apochresis CANDÈZE.
1881. Elat. Nouv., fasc. 3, p. 46.
Type.—*Apochresis asper* CANDÈZE. (Monobasic.)

[**Apocryptus** (Candèze) SHARP, typ. err.]=**Acrocryptus** CANDÈZE.
1874, Zool. Rec., p. 290.
Type.—*Cryptotarsus ater* PHILIPPI.

[**Apotarsus** STEPHENS, typ. err.]=**Aplotarsus** STEPHENS, 1830, Ill. Brit. Ent. Mand., vol. 3, p. 245, in table.
Type.—*Aplotarsus rufipes* FABRICIUS.

[**Aptonychus** MOTSCHULSKY=nomen nudum.]
1859, Bull. Soc. Imp. Nat. Mosc., vol. 32, pt. 2, p. 359, in table, no species included.

NOTE.—This genus is not referred to by Candèze, Gemminger and Harold, or O. Schwarz.

Aptopus ESCHSCHOLTZ.
1829, Thon. Arch., vol. 2, pt. 1, p. 32, two species.
Type.—*Aptopus tibialis* ESCHSCHOLTZ. (Present designation.)

NOTE.—The other species *Aptopus ephippeger* ESCHSCHOLTZ is now referred to *Triplonychus* CANDÈZE. Candèze (1860) reduces *Cardiophorus tibialis* ERICHSON to synonymy under *Cardiophorus ruficruris* BRULLE. He does not mention *Aptopus tibialis* ESCHSCHOLTZ, but says that of the two Eschscholtz species of *Aptopus* but one is known to him (*A. ephippeger*).

Arachnodima CANDÈZE.
1893, Elat. Nouv., fasc. 5, p. 54.
Type.—*Arachnodima opaca* CANDÈZE. (Monobasic.)

Archontas GOZIS.
1886, Recher. Esp. Typ., p. 23.
Type.—*Elater murinus* LINNAEUS, Syst. Nat., vol. 2, 1759. (Monobasic.)

NOTE.—Candèze (1891) reduces this genus to synonymy under *Lacon* CASTELNAU.

Arctapila CANDÈZE.
1891, Cat. Method., p. 119.
Type.—*Cryptohypnus bruckii* CANDÈZE, Elat. Nouv., fasc. 1, p. 38, 1865. (Monobasic.)

Arhaphes CANDÈZE=**Arrhaphes** CANDÈZE, emend. 1891)=(**Arraphus** SCUDDER, emend.)=(**Arrhaphus** MARSHALL, emend.).
1860, Monogr. Elat., fasc. 3, p. 98.
Type.—*Arhaphes diptychus* CANDÈZE. (Monobasic.)

[**Arraphus** (Candèze) SCUDDER emend.]=**Arhaphes** CANDÈZE.
1882 Nomen. Zool., Index, p. 28.
Type.—*Arhaphes diptychus* CANDÈZE.

[**Arrhaphes** CANDÈZE emend.]=**Arhaphes** CANDÈZE.
1891, Cat. Method., p. 120.
Type.—*Arhaphes diptychus* CANDÈZE.

[**Arrphaphus** (Candèze) MARSHALL, typ. err., not ANGELIN 1854, Crustacea]=**Arhaphes** CANDÈZE.
1873, Nom. Zool., p. 172.
Type.—*Arhaphes diptychus* CANDÈZE.

[**Asaphes** KIRBY, not WALKER 1834, Hymenoptera]=**Hemicrepidius** GERMAR.
1837, Fauna Bor. Amer., vol. 4, p. 146.
Type.—*Pedetes* (*Asaphes*) *ruficornis* KIRBY. (Monobasic.)

Asaphoides SCHWARZ.
1906, Deut. Ent. Zeit., p. 366, two species.
Type.—*Asaphoides nigripennis* SCHWARZ. (Present designation.)

Ascesis CANDÈZE.
1863, Monogr. Elat., vol. 4, p. 440.
Type.—*Ascesis australis* CANDÈZE. (Monobasic.)

Asebis CANDÈZE.
1895, Ann. Mus. Stor. Nat. Genova, vol. 34, p. 487.
Type.—*Asebis modigliani* CANDÈZE. (Monobasic.)

Asymphus SHARP.
1886, Trans. Roy. Soc. Dublin, p. 402, two species.
Type.—*Asymphus insidiosus* SHARP. (Present designation.)

[**Atelopus** ERICHSON, not DUMERIL 1840, Reptilia]=**Acroniopus** ERICHSON.
1842, Wiegm. Arch. f. Naturg., vol. 1, p. 142, four species.
Type.—*Atelopus humilis* ERICHSON. (Present designation.)

NOTE.—Candèze (1863) and Gemminger and Harold (1869) reduce this genus to synonymy under *Acroniopus* ERICHSON.

Athoomorphus SCHWARZ.
1898. Deut. Ent. Zeit., p. 156.
Type.—*Athoomorphus cylindricus* SCHWARZ. (Monobasic.)

[**Athouinus** REITTER]=**Elathouina** REITTER.
1905, Bestim. Tab., Heft 56, p. 114. One species, two synonyms.
Type.—*Athous revelieri* MULSANT, Ann. Soc. Linn. Lyon, p. 416, 1874. (Monobasic.)

NOTE.—Isogenotypic with *Elathouina* REITTER.

Athous ESCHSCHOLTZ=**Eschscholtzia** LAPORTE, not LESSNE, 1836).
1829, Thon. Arch., vol. 2, pt. 1, p. 33, Thirteen species.
Type.—*Elater hirtus* HERBST, Fuessl. Arch. 1791. (Designation of Thomson, Skand. Col., vol. 1, p. 104, 1859.)

NOTE.—*Athous niger* LINNAEUS type by designation of Reitter, Bestim, Tab., Heft 56, p. 31, 1905, was not originally included, but *E. hirtus* HERBST is now generally conceded to be a synonym of *E. niger* LINNAEUS. O. Schwarz (1906), however, recognizes *Athous hirtus* HERBST and *Athous niger* LINNAEUS as distinct species.

Athousius REITTER.
1905, Bestim. Tab., Heft 56, pp. 13, 112.
Type.—*Athous holdereri* REITTER, Wien. Ent. Zeit., p. 159, 1900. (Monobasic.)

[**Atractodes** GERMAR, not GRAVENHORST 1829, Hymenoptera]=**Atractosomus** LACORDAIRE.
1839, Zeit. f. d. Ent., vol. 1, p. 219. Three species.
Type.—*Atractodes flavescens* GERMAR. (Present designation.)

NOTE.—Candèze (1859) reduces the genus to synonymy under *Atractosomus* LACORDAIRE.

Atractopterus LECONTE.
1853, Trans. Amer. Philos. Soc., vol. 10, p. 454. Three species.
Type.—*Atractopterus fusiformis* LECONTE. (Present designation.)

NOTE.—Candèze (1863) reduces the genus to synonymy under *Sericosomus* REDTENBACHER, and Gemminger and Harold (1869) reduce the genus to synonymy under *Sericus* ESCHSCHOLTZ.

Atractosomus LACORDAIRE (=**Atractodes** GERMAR, not GRAVENHORST, 1829).
1857, Gen. Col., vol. 4, p. 173, new name for *Atractodes* GERMAR, praeoc.
Type.—*Atractodes flavescens* GERMAR.

Bedresia SOLIER.
1851, Gay, Hist. fis. Chile, Zool., vol. 5, p. 20. Two species.
Type.—*Bedresia impressicollis* SOLIER. (Present designation.)

NOTE.—Candèze (1860) refers *Bedresia punctato-sulcata* SOLIER, the other originally included species, to the genus *Medonia* CANDÈZE. He refers the type to *Grammophorus* SOLIER.

Belania LAPORTE DE CASTELNAU.

1840, Hist. Nat. Anim. Artic., Col., vol. 1, p. 236.

Type.—*Pyrophorus buphthalmus* (Klug) ESCHSCHOLTZ, Thon. Arch., vol. 2, pt. 1, p. 32, 1829. (Monobasic.)

NOTE.—Candèze (1863) refers the type to *Pyrophorus* ILLIGER.

Beliophorus ESCHSCHOLTZ.

1829, Thon. Arch., vol. 2, pt. 1, p. 34. Two species.

Type.—*Beliophorus cebrionoides* ESCHSCHOLTZ, (Original designation.)

Betarmon KIESENWETTER.

1863, Naturg. Ins. Deutschl., vol. 4, p. 265. Two species.

Type.—*Elater bisbimaculatus* SCHÖNHERR, Syn. Ins., vol. 3, p. 313, 1817. (Present designation.)

NOTE.—Gemminger and Harold (1869) reduced the type to synonomy under *Betarmon bisbimaculatus* FABRICIUS. O. Schwarz (1906) reduces *E. bisbimaculatus* FABRICIUS to synonymy under *Betarmon ferrugineus* SCOPOLI.

Betarmonides SCHWARZ.

1906, Gen. Ins., fasc. 46, p. 147. Six species.

Type.—*Betarmon frontalis* SHARP, Ann. Mag. Nat. Hist., ser. 4, vol. 19, p. 13, 1877. (Present designation.)

Biadelater [1] HANDLIRSCH.

1906, Die Fossilen Insect., vol. 1, p. 559, pl. 45, fig. 60.

Type.—*Elater werneri* GIEBEL, Ins. Vorw., p. 92, 1856. (Monobasic.)

[**Bionychus** MOTSCHULSKY=nomen nudum.]

1859, Bull. Soc. Imp. Nat. Mosc., vol. 32, pt. 2, p. 360 (in table without species).

Bladus LECONTE.

1861, Class. N. A. Coleo, p. 171. In table without species.

1866, List Col. N. Amer., pt. 1, p. 48.

Type.—*Elater quadricollis* SAY, Trans. Amer. Philos. Soc., vol. 6, p. 186, 1839. (Monobasic.)

Blauta LECONTE.

1853, Trans. Amer. Philos. Soc., vol. 10, p. 472.

Type.—*Blauta cauta* LECONTE. (Monobasic.)

NOTE.—Candèze (1859) reduces the species to synonymy under *Blauta cribraria* GERMAR.

[**Blax** CANDÈZE, not THOMSON, 1860, Longicornia]=**Metablax** CANDÈZE.

1863, Monogr. Elat., vol. 4, p. 200, two species.

Type.—*Elater acutipennis* WHITE, Zool. Voy. *Erebus* and *Terror*, vol. 11, p. 7, 1846. (Present designation.)

NOTE.—O. Schwarz reduces the genus to synonymy under *Metablax* CANDÈZE and misspells the type *acuminatus*.

Brachycrepis LECONTE.

1853, Trans. Amer. Philos. Soc., vol. 10, p. 460.

Type.—*Brachycrepis bicarinatus* LECONTE. (Monobasic.)

NOTE.—Candèze (1859) reduces the genus to synonymy under *Anchastus* LECONTE.

Brachylacon MOTSCHULSKY.

1858, Etudes Ents., 7th year, p. 60.

Type.—*Brachylacon microcephalus* MOTSCHULSKY. (Monobasic.)

NOTE.—Gemminger and Harold (1869) reduce the genus to synonymy under *Lacon* CASTELNAU.

Brounaeolus HYSLOP, new name=(Exaeolus BROUN, not GOZIS, 1886).

New name for *Exaeolus* BROUN preoccupied.

Type.—*Exaeolus rufescens* BROUN.

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[1] Fossil.

[**Calais** Laporte de Castelnau, not Boisduval, 1836, Lepidoptera]=**Alaus** Eschscholtz.

1836, Silb. Rev. Ent., vol. 4, p. 9. Two new species.

Type.—*Calais senegalensis* Castelnau. (Present designation.)

Note.—Candèze (1857) places both of the originally included species in *Alaus* Eschscholtz, but recognizes the genus as valid for a group of West Indian and South American species. O. Schwarz (1906) reduces the genus as recognized by Candèze in a subgenus of *Alaus* Eschscholtz.

Calambus Thomson.

1859, Skand. Col., vol. 1, p. 103.

Type.—*Elater bipustulatus* Linnaeus, Syst. Nat., ed. 10. vol. 1, pt. 2, p. 662, 1758. (Monobasic.)

Note.—Gemminger and Harold (1869) reduce the genus to synonymy under *Corymbites* Latreille.

Caldeonius Candèze.

1895, Ann. Soc. Ent. Belg., p. 67.

Type.—*Caldeonius suturalis* Candèze. (Monobasic.)

Caleodinus Candèze=(*Calcodonius* (Candèze) Schwarz, typ. err.).

1900, Elat. Nouv., fasc. 7, p. 97.

Type.—*Caleodinus fairmairei* Candèze. (Monobasic.)

Caledonius (Candèze) Schwarz, typ. err.]=**Caleodinus** Candèze.

1906, Gen. Ins., fasc. 46, p. 233.

Type.—*Caleodinus fairmairei* Candèze.

[**Calocerus** (Westwood) Candèze]=**Pityobius** LeConte.

1860, Monogr. Elat., vol. 3, p. 415.

Type.—*Calocerus niger* Westwood (MMS.).

Note.—Candèze reduces this species to synonymy as manuscript name under *Pityobius anguinus* LeConte.

Caloderus Stephens.

1830, Ill. Brit. Ent., Mand., vol. 3, p. 269. Three species.

Type.—*Elater thoracicus* Fabricius, Syst. Eleuth., vol. 2, p. 236, 1801. (Present designation.)

Note.—Candèze (1860) reduces the genus to synonymy under *Cardiophorus* Eschscholtz and reduces the type to synonymy under *Cardiophorus thoracicus* Linnaeus.

[**Calosirus** Koenig, not Thomson, 1859, Curculionidae]=**Ludius** Eschscholtz.

1887, Hor. Ent. Ross., vol. 21, p. 353.

Type.—*Corymbites* (*Calosirus*) *melas* Koenig. (Monobasic.)

Calostirus Buysson.

1897, Bull. Soc. Ent. France, p. 296. Two species and one variety.

Type.—*Calostirus purpureus* Poda, var. *atropilosus* Buysson. (Present designation.)

[**Campilomorphus** (Duval) Reitter emend.]=**Campylomorphus** Duval.

1905, Bestim. Tab., Heft 56, p. 7.

Type.—*Elater homalisinus* Illiger.

Campsosternus Latreille.

1834, Ann. Soc. Ent. France, vol. 3, p. 141.

Type.—*Elater fulgens* Fabricius, Ent. Syst., vol. 2, p. 20, 1775. (Monobasic.)

Note.—Gemminger and Harold (Cat. 1869) reduce the type of synonymy under *Campsosternus auratus* Drury. O. Schwarz follows Gemminger and Harold, but credits *auratus* to Westwood.

[**Campylinus** (Schaufuss) O. SCHWARZ, typ. err. for *Campylus* FISCHER]=**Lepturoides** HERBST.

1906, Gen. Ins., fasc. 46, p. 204.

Type.—*Lepturoides linearis* HERBST.

Campyloides SCHWARZ.

1906, Gen. Ins., fasc. 46, p. 299.

Type.—*Pleonomus fleutiauxi* SCHWARZ, Deut. Ent. Zeit., p. 292, 1905. (Monobasic.)

Campylomorphus JACQUELIN DU VAL=(**Campilomorphus** REITTER, emend., 1905).

1860, Gen. Col. Eur., vol. 3, p. 120.

Type.—*Elater homalisinus* ILLIGER, Mag., vol. 6, p. 114, 1807. (Monobasic.)

Campylopsephus SCHWARZ.

1899, Deut. Ent. Zeit., p. 65. Eleven species.

Type.—*Campylopsephus nigromarginatus* SCHWARZ. (Present designation.)

NOTE.—Erected as a subgenus of *Psephus* CANDÈZE.

Campyloxenus FAIRMAIRE.

1860, Rev. Zool., p. 267.

Type.—*Campyloxenus pyrothorax* FAIRMAIRE. (Monobasic.)

[**Campylus** FISCHER]=**Lepturoides** HERBST.

1824, Entomog. Imp. Russ., vol. 2, p. 453.

Type.—*Elater linearis* LINNAEUS, Syst. Nat., ed. 10, vol. 1, pt. 2, p. 653, 1758. (Monobasic.)

NOTE.—Isogenotypic with *Lepturoides* HERBST, 1784.

[**Candezia** DEYROLLE *nomen nudum*]=**Anathesis** CANDÈZE.

1864, Cat.

NOTE.—The name has no status, as it only appears in a sales catalog. Given as synonym of *Anathesis* by Candèze, Elat. Nouv., vol. 1, 1865, when erecting this latter genus.

[**Cardiaphorus** (Motschulsky) GEBLER, typ. err.]=**Cardiophorus** ESCHSCHOLTZ.

1859, Bull. Soc. Imp. Nat. Moscow, vol. 32, p. 455.

1860, Schrank, Reis. Amur., vol. 2, Coleo., p. 111. Two species.

Type.—*Elater ruficollis* LINNAEUS.

Cardiophorus ESCHSCHOLTZ=(**Cardiaphorus** (Motschulsky) GEBLER, typ. err.).

1829, Thon. Arch., vol. 2, pt. 1, p. 34. Thirteen species.

Type.—*Elater ruficollis* LINNAEUS, Faun. Seuc., p. 724, 1746. (Designation Thomson, Skand. Col., vol. 1, p. 104, 1859.)

NOTE.—*Elater ruficollis* FABRICIUS, Syst. Eleuth., vol. 2, p. 227, 1801, was originally included, not Linnean species, but Fabricius (same reference) referred the species to Linnaeus.

Cardiorhinus ESCHSCHOLTZ=(**Cardiorrhinus** (Eschscholtz) SCUDDER, emend. 1882).

1829, Thon. Arch., vol. 2, pt. 1, p. 34. Twelve species.

Type.—*Cardiorhinus seminiger* ESCHSCHOLTZ. (Present designation.)

[**Cardiorrhinus** (Eschscholtz) SCUDDER, emend.]=**Cardiorhinus** ESCHSCHOLTZ.

1882, Nom. Zool., p. 60.

Type.—*Cardiorhinus seminiger* ESCHSCHOLTZ.

Cardiotarsus ESCHSCHOLTZ.

1833, Dejean Cat., ed. 3, p. 91. One manuscript species.

1836, Silber, Rev. Ent., vol. 4, opposite p. 5. In table without species.

1860, Candèze, Monogr. Elat., vol. 3, p. 223. Ten species.

Type.—*Cardiotarsus capensis* CANDÈZE. (Present designation.)

Cataphagus STEPHENS.

1830, Ill. Brit. Ent., Mand., vol. 3, p. 245, and p. 247. Six species.

Type.—*Cataphagus* (*Hemirhipus*) *acuminatus* STEPHENS. (Present designation.)

NOTE.—Candèze (1863) and Gemminger and Harold (1869) reduce the genus to synonymy under *Agriotes* ESCHSCHOLTZ.

Celox SCHAUFUSS.

1863, Isis, Sitzungsb., p. 201.

Type.—*Celox dima* SCHAUFUSS. (Monobasic.)

NOTE.—Candèze (1891) reduces the genus to synonymy under *Dima* ESCHSCHOLTZ and reduces the type to synonymy under *Dima perezia* SEIDLITZ.

Centhrostethus SCHWARZ=(**Enoploderes** SCHWARZ, not FALDERMANN, 1837).

1898, Deut. Ent. Zeit., pp. 131 and 414, new name for Enoploderes, preoccupied.

Type.—*Elater* (*Conoderus* Eschscholtz) *cuspidatus* KLUG.

NOTE.—Candèze (1857) places the type in *Tilotarsus* GERMAR. O. Schwarz (1906) considers this determination of Candèze's as erroneous and places *T. cuspidatus* CANDÈZE, not KLUG, in synonymy under *T. cinctipes* GERMAR.

Ceroplastus SEIDLITZ=(**Plastocerus** SCHAUM, 1852, not Leconte, 1853).

1888, Fauna Baltica, ed. 2, p. 42. New name for *Plastocerus* SCHAUM, not LECONTE.

Type.—*Callirhipis angulosus* GERMAR.

NOTE.—A Rhipicerid only included in this list in connection with *Plastocerus* LECONTE.

[**Chalcocrepidius** MOTSCHULSKY=nomen nudum.]

1859, Bull. Soc. Imp. Nat. Mosc., vol. 32, pt. 2, p. 358. In table; no species.

Chalcolepidius ESCHSCHOLTZ.

1829, Thon. Arch., vol. 2, pt. 1, p. 32. Seven species.

Type.—*Chalcolepidius zonatus* ESCHSCHOLTZ. (Present designation.)

Chalcolepis CANDÈZE.

1857, Monogr. Elat., vol. 1, p. 244.

Type.—*Chalcolepis luczotii* CANDÈZE. (Monobasic.)

Charitophyllus LACORDAIRE (**Phyllophorus** HOPE, 1842, not GRUBE, 1840).

1857, Gen. Col., vol. 4, p. 165. Nef name for *Phyllophorus* Hope, preoc.

Type.—*Elater gigas* FABRICUS, Syst. Eleut., vol. 2, p. 291, 1801. (Monobasic.)

NOTE.—Candèze (1857) reduces the genus to synonymy under *Tetralobus* LEPELLETIER and SERVILLE.

[**Chrosis** CANDÈZE, not GUENEE, 1845, Lepidoptera]=**Elatichrosis** HYSLOP, new name.

1863, Monogr. Elat., vol. 4, p. 185. Three species.

Type.—*Chrosis exarata* CANDÈZE. (Present designation.)

Chrostus CANDÈZE.

1878, Elat. Nouv., fasc. 2, p. 42.

Type.—*Chrostus quadrifoveolatus* CANDÈZE. (Monobasic.)

Cidnopus THOMSON.

1859, Skand. Col., vol. 1, p. 106.

Type.—*Elater nigripes* GYLLENHAL, Ins. Suec., vol. 1, p. 395, 1817. (Monobasic.)

NOTE.—Candèze (1860) refers the type to *Limonius* ESCHSCHOLTZ. Gemminger and Harold (1869) reduced the genus to synonymy under *Limonius* ESCHSCHOLTZ and the type to synonymy under *Limonius pilosus* LESKE.

[**Cladocerus** (Dupont in litt.) GEMMINGER and HAROLD, not RAFINESQUE, 1819, not KIRSCH, 1865, Malacodermata]=**Piezophyllus** HOPE.

1869, Cat. Coleop., vol. 5, p. 1509.

Type.—*Tetralobus macrocerus* CASTELNAU. (Monobasic.)

NOTE.—This name first appears in Gemminger and Harold, Cat., 1869, as a synonym of *Piezophyllus* HOPE with the single species *Tetralobus macrocerus* CASTELNAU.

[**Cladocerus** SCHWARZ, not KIRSCH, 1865, Malacodermata]=**Plastocerus** SHAUM.

1901, Deut. Ent. Zeit., p. 199–201. New name for *Plastocerus* CANDÈZE, not LECONTE.

Type.—*Callirhipis angulosus* GERMAR. (Monobasic.)

NOTE.—A Rhipocerid only cited here in connection with *Plastocerus* LECONTE.

Clon SEMENOW.

1900, Hor. Soc. Ent. Rossica, vol. 34, p. 594. Two species.

Type.—*Clon cerambycinus* SEMENOW. (Present designation.)

NOTE.—O. Schwarz (1906) misspells the type *cerambyciformis* and gives the bibliographical reference to the genus as volume 24.

Compshelus CANDÈZE=(**Compsohelus** (Candèze) SHARP, emend., 1878).

1878, Elat. Nouv., fasc. 2, p. 48.

Type.—*Compshelus flavus* CANDÈZE. (Monobasic.)

NOTE.—O. Schwarz (1906) misspells the type *flavns*.

Compsoctenus PHILIPPI.

1861, Ann. Univ. Chile, vol. 18, p. 743.

Type.—*Compsoctenus elegans* PHILIPPI. (Monobasic.)

[**Comps(o)helus** (Candèze) SHARP, emend.]=**Compshelus** CANDÈZE.

1878, Zool. Rec. Ins., p. 70.

Type.—*Compshelus flavus* CANDÈZE.

Compsolacon REITTER.

1905, Bestim. Tab., Heft 56, p. 6.

Type.—*Archontas crenicollis* MENETRIES, Cat. Rais., p. 106, 1832. (Monobasic.)

Conoderus ESCHSCHOLTZ.

1829, Thon. Arch., vol. 2, pt. 1, p. 31. Five species.

Type.—*Conoderus fuscofasciatus* ESCHSCHOLTZ. (Present designation.)

NOTE.—CANDÈZE (1859) reduces the genus to synonomy under *Monocrepidius* ESCHSCHOLTZ.

[**Conoderus** CHEVROLAT, not ESCHSCHOLTZ, 1829]=**Psiloniscus** CANDÈZE.

1835, Col. d. Mex. Century 2, No. 198.

Type.—*Conoderus apicalis* CHEVROLAT. (Monobasic.)

Coptostethus WOLLASTON=(**Coptosthetus** CANDÈZE, typ. err., 1860).

1854, Ins. Madeir., p. 238, pl. 4, fig. 8.

Type.—*Coptostethus femoratus* WOLLASTON. (Monobasic.)

[**Coptosthetus** (Wollaston) CANDÈZE, typ. err.]=**Coptostethus** WOLLASTON.

1860, Monogr. Elat., vol. 3, p. 504. Index.

Type.—*Coptostethus femoratus* WOLLASTON.

[**Coresus** (Dejean in litt.) GEMMINGER and HAROLD]=**Coresus** CANDÈZE.

1869, Cat. Coleop., vol. 5, p. 1509.

Type.—*Tetralobus macrocerus* CASTELNAU.

NOTE.—Gemminger and Harold (1869) reduce this genus to synonymy under *Piezophyllus* HOPE.

Coresus CANDÈZE=(*Coresus* DEJEAN, manuscript name).

1891, Cat. Method., p. 49.

Type.—*Tetralobus macrocerus* LAPORTE DE CASTELNAU, Silbermann's Rev. Ent., p. 12, 1836. (Monobasic.)

[**Corymbites** Latreille] = **Ctenicera** Latreille.

1834, Ann. Soc. Ent. France, vol. 3, p. 150. Four species.

Type.—*Elater pectinicornis* Linnaeus, Syst. Nat., vol. 2, p. 265, 1740. (Designation Thomson, Skand. Col., vol. 1, p. 102, 1859.)

Note.—*Elater pectinicornis* Linnaeus is congeneric with *Elater cupreus* Fabricius, the type of *Ludius* Eschscholtz, 1829, which genus preoccupies *Corymbites* Latreille. Latreille (1834) credits the type to Linnaeus, as does also Fabricius. Isogenotypic with *Ctenicera* Latreille.

Corymbitodes Buysson.

1904, Bull. Soc. Ent. France, p. 58.

Type.—*Corymbitodes longicollis* Buysson. (Monobasic.)

Coryssodactylus Schwarz.

1897, Deut. Ent. Zeit., p. 15.

Type.—*Dicronychus puerulus* Candèze, Elat. Nouv., fasc. 4, p. 21, 1889 (Monobasic.)

Cosmesus Eschscholtz.

1829, Thon. Arch., vol. 2, pt. 1, p. 33.

Type.—*Cosmesus bilineatus* Eschscholtz. (Monobasic.)

Note.—O. Schwarz (1906), though recognizing the genus, removes the type to *Parapomachilius* Schwarz.

[**Craspedonotus** Schwarz, not Schaum, 1863, Carabidae] = **Craspedostethus** Schwarz.

1898, Deut. Ent. Zeit., p. 148. Three species.

Type.—*Cardiophorus* (*Craspedonotus*, new genus) *rufiventris* Schwarz. (Present designation.)

Craspedostethus Schwarz = (**Craspedonotus** Schwarz, not Schaum, 1863).

1898, Deut. Ent. Zeit., p. 414, new name for *Craspedonotus* Schwarz, preoccupied.

Type.—*Cardiophorus* (*Craspedonotus*, new genus) *rufiventris* Schwarz.

Cratonychus Dejean = (**Dichelonychus** Fairmaire, typ. err.).

1833, Dejean Cat., ed. 3, p. Twenty-eight species, eleven synonyms, one variety.

Type.—*later castanipes* Paykull. Fauna. Suec. Insect., vol. 3, p. 23, 1800. (Designation Thomson, Skand. Col., vol. 1, p. 104, 1859.)

Note.—Candèze (1860) reduces the genus to synonymy under *Melanotus* Eschscholtz and reduces *E. obscurus* Fabricius to synonymy under *E. castanipes* Paykull. Gemminger and Harold (1869) credit the genus to Lacordaire and reduce it to synonymy under *Melanotus* Eschscholtz. *Elater obscurus* Fabricius is designated by E. Blanchard, His. Nat. Ins., vol. 2, p. 76, 1873, as type, and O. Schwarz (1906) places the genus, which he credits to Erichson, in synonymy under *Psellis* Candèze.

[**Cratonychus** Reiche, not Dejean and Erichson] = **Silesis** Candèze.

1856, Ann. Soc. Ent. France, p. 414.

Type.—*Cratonychus dimidiatipennis* Reiche. (Monobasic.)

Note.—Candèze (1863) reduces the type to synonymy under *Silesis terminatus* Erichson.

Cremnostethus Schwarz.

1901, Deut. Ent. Zeit., p. 197. Two species.

Type.—*Cremnostethus nigricollis* Schwarz. (Present designation.)

Crepicardus (Dejean) Candèze = (**Melantho** Laporte, not Bowditch, 1822).

1833, Dejean Cat., ed. 3, p. 103, one manuscript species.

1857, Candèze, Monogr. Elat., vol. 1, p. 187.

Type.—*Melantho klugii* Laporte de Castelnau Silberman's Rev. Ent., vol. 4, p. 10, 1836. (Monobasic.)

Note.—The genus is first mentioned with a described species by Candèze (1857), where he places the species *Crepicardus miles* Dejean (MSS.) in synonymy under *Melantho klugii* Castelnau.

Crepidius CANDÈZE.

1859, Monogr. Elat., vol. 2, p. 80, Nine species.

Type.—*Crepidius resectus* CANDÈZE. (Present designation.)

Crepidomenus ERICHSON.

1842, Wiegmann Arch. f. Naturg., vol. 1, p. 140. Three species.

Type.—*Crepidomenus fulgidus* ERICHSON. (Present designation.)

Crepidophorus MULSANT.

1853, Opusc. Ent., vol. 2, p. 189.

Type.—*Crepidophorus anthracinus* MULSANT. (Monobasic.)

NOTE.—*Athous mutilatus* ROSENHAUER (by designation Reitter, Bestim. Tab., Heft 56, p. 32, 1905) was not originally included, but this species is recognized as synonymous with the type and has priority. Candèze (1860) reduces the genus to synonymy under *Athous* ESCHSCHOLTZ, and the type to synonymy under *Athous mutilatus* ROSENHAUER.

Crepidotritus LECONTE.

1861, Class. Coleo. N. A., pt. 1, p. 167. Two species.

Type.—*Cryptohypnus cinereipennis* MANNERHEIM Bull. Soc. Imp. Nat. Mosc., vol. 16, pt. 1, p. 240, 1843. (Present designation.)

NOTE.—Candèze (1859) reduces the genus to synonymy under *Anchastus* LECONTE, and the type to synonymy under *Anchastus cinereipennis* ESCHSCHOLTZ.

Crigmus LECONTE.

1853, Trans. Amer. Philos. Soc., vol. 10, p. 453.

Type.—*Aphanobius hepaticus* GERMAR, Zeit. f. d. Ent., vol. 5, p. 184, 1844. (Original designation.)

NOTE.—Germar (1844) refers *Elater hepaticus* GERMAR (1824) to synonymy under this species. Candèze (1863) reduces the genus to synonymy under *Ludius* LATREILLE and the type to synonymy under *Elater hepaticus* GERMAR.

[**Cryphthypnus** (Germar) KIESENWETTER, emend.]=**Cryptohypnus** ESCHSCHOLTZ.

1863, Naturg. d. Ins. Deutschl., vol. 4, p. 357.

Type.—*Hypolithus littoralis* ESCHSCHOLTZ.

Cryptagriotes[1] WICKHAM.

1916, Bull. Mus. Comp. Zool. Harvard, vol. 60, 12, p. 512.

Type.—*Cryptagriotes minusculus* WICKHAM. (Original designation.)

Cryptohypnus ESCHSCHOLTZ=(**Cryphthypnus** (GERMAR) KEISENWETTER, emend.).

1833, Dejean, Cat., ed. 3, p. 93, fifteen species.

1836, Silbermann, Rev. Ent., vol. 4 (in table no species).

Type.—*Hypolithus littoralis* ESCHSCHOLTZ, Thon. Arch., vol. 2, pt. 1, p. 34, 1829. (Present designation.)

NOTE.—*Elater riparius* FABRICIUS (by designation Thomson, Skand. Col., vol. 1, p. 106, 1859, and also by Gozis, Recher, Esp. Typ., p. 22, 1886) is not available, as it is the type of *Hypnoidus* STEPHENS.

[**Cryptotarsus** PHILIPPI, not KIRSCH, 1865, Malocodermata]=**Acrocryptus** CANDÈZE.

1873, Stett. Ent. Zeit., vol. 34, p. 308.

Type.—*Cryptotarsus ater* PHILIPPI. (Monobasic.)

NOTE.—O. Schwarz (1906), reduces the genus to synonymy under *Acrocryptus* CANDÈZE.

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[1] Fossil.

Ctenicera Latreille=(**Corymbites** Latreille).

1829, Cuvier Regne Anim., vol. 4, p. 454. Four species.

Type.—*Elater pectinicornis* Linnaeus, Syst. Nat., vol. 2, p. 655, 1759. (Designation of Westwood, Int. Mod. Class. Ins., vol. 2, Gen. Syn., p. 25, 1840.)

Note.—Candèze (1863) reduces the genus to synonymy under *Corymbites* Latreille. O. Schwarz (1906) recognizes the genus as valid, but places the type in *Ludius* Eschscholtz.

Ctenicerus (Latreille) Stephens.

1830, Ill. Brit. Ent. Mand., vol. 3, p. 264. Seven species.

Type.—*Elater aulicus* Panzer, Faun. Germ., p. 77, 1801. (Designation of Gozis, Recher, Esp. Typ., p. 22, 1886.)

Note.—Candèze (1863) reduces the type to synonymy under *Corymbites aeneicollis* Olivier. Gemminger and Harold (1869) reduce the type to a variety of *Corymbites virens* Schrank.

Ctenonychus Stephens=(**Diacanthus** Latreille, not Stiebel, 1817).

1830, Ill. Brit. Ent. Mand., vol. 3, p. 272.

Type.—*Ctenonychus hirsutus* Stephens. (Monobasic.)

Note.—O. Schwarz (1906) reduces the genus to synonymy under *Synaptus* Eschscholtz, and the type to synonymy under *S. filiformis* Fabricius.

Ctenoplus Candèze.

1863, Monogr. Elat., vol. 4, p. 463.

Type.—*Ctenoplus javanensis* Candèze. (Monobasic.)

Note.—O. Schwarz (1906) misspells the type *javanus* Candèze.

Cyathodera Blanchard.

1843, Voy. d'Orbigny, Col., p. 130.

Type.—*Cyathodera longicornis* Blanchard. (Monobasic.)

Note.—The crediting of Brulle by Agassiz is a mistake. Candèze (1859) reduces the genus to synonymy under *Anoplischius* Candèze. O. Schwarz (1906) reduces the genus to a subgenus of *Anoplischius* Candèze.

Cylindroderoides Schwarz.

1906, Gen. Ins., fasc. 46, p. 309. Eight species.

Type.—*Cylindroderus stenoderus* Candèze, Monogr. Elat, vol. 4, p. 505, 1863. (Present designation.)

Note.—Erected as a subgenus of *Cylindroderus* Eschscholtz.

Cylindroderus Latreille.

1834, Ann. Soc. Ent. France, vol. 3, p. 163.

Type.—*Cebrio femoratus* Germar, Ins. Sp. Nov., p. 61, 1824. (Monobasic.)

Dacnitus Sharp.

1908, Fauna Hawaii., vol. 3, p. 384.

Type.—*Dacnitus currax* Sharp. (Monobasic.)

Dactylophysus Fleutiaux.

1892, Ann. Soc. Ent. France, vol. 61, p. 408. Two species.

Type.—*Heterocrepidius mendax* Candèze, Monogr., vol. 2, p. 39, 1859. (Designation of Sharp, Zool. Rec., vol. 29, p. 127, 1892.)

[**Dajakus** (Candèze) O. Schwarz, emend.]=**Dayakus** Candèze.

1906, Gen. Ins., fasc. 46, p. 63.

Type.—*Dayakus angularis* Candèze.

Dalopius (Megerle) Eschscholtz=(**Dolopius** Eschscholtz, emend.).

1829, Thon. Arch., vol. 2, pt. 1, p. 34. Two species.

Type.—*Elater marginatus* Fabricius Syst. Eleuth., vol. 2, 1801. (Present designation.)

Note.—Candèze (1863) reduces the type to synonymy under *Sericosomus marginatus* (Linnaeus).

Danosoma THOMSON.

1895, Skand. Col., vol. 1, p. 103.

Type.—*Elater conspersa* GYLLENHAL, Ins. Suec., vol. 1, p. 377, 1817. (Monobasic.)

NOTE.—Gemminger and Harold (1869) reduce the genus to synonymy under *Adelocera* LATREILLE.

Dayakus CANDÈZE=(**Dajakus**) (CANDÈZE) SCHWARZ, emend.).

1893, Elat. Nouv., fasc. 5, p. 22.

Type.—*Dayakus angularis* CANDÈZE. (Monobasic.)

Denticollis PILLER and MITTERSPACHER.

1783, It. Poseg., p. 86. Two species.

Type.—*Denticollis rubens* PILLER and MITTERSPACHER. (Present designation.)

NOTE.—Candèze (1863) refers the type to *Campylus* FISCHER. Gemminger and Harold (1869) refer the type to *Lepturoides* HERBST. O. Schwarz (1906) reduces the genus to synonymy under *Lepturoides* HERBST, following Candèze (1891) stating that it is an adjective and therefore untenable.

Deromecus SOLIER.

1851, Gay. Hist. fis. Chile, Zool., vol. 5, p. 11. Eight species.

Type.—*Deromecus angustatus* SOLIER. (Present designation.)

[**Diacantha** SOLIER, not CHEVROLAT, 1834, Chrysomelidae]=**Grammephorus** SOLIER.

1851, Gay. Hist. fis. Chile, vol. 5, p. 23.

Type.—*Diacantha nigra* SOLIER. (Monobasic.)

NOTE.—Candèze (1859) reduces the genus to synonymy under *Grammephorus* SOLIER and corrects the form of the specific name from *nigra* to *niger*.

Diacanthous REITTER.

1905, Bestim. Tab., Heft 56, p. 25. One species, five varieties.

Type.—*Athous undulatus* DEGEER, Ins., vol. 4, p. 155, 1752–1778. (Monobasic.)

NOTE.—O. Schwarz (1906) reduces the genus to a subgenus of *Harminius* FAIRMAIRE.

[**Diacanthus** LATREILLE, not STIEBEL, 1817. Vermes]=**Ctenicerus** STEPHENS, 1834, Ann. Soc. Ent. France, vol. 3, p. 151. Four species.

Type.—*Elater aeneus* FABRICUS.

NOTE.—*Elater aulicus* PANZER, Faun. Germ., p. 77, 1793–1809. (Designation of Gozis, Rech. Esp. Typ., p. 22, 1886) not originally included.

Isogenotypic with *Ctenicerus* STEPHENS. *Elater aeneus* LINNAEUS (by designation Thomson, Skand. Col., vol. 1, p. 102, 1859) is not available, being the type of *Aphotistus* KIRBY. Candèze (1863) reduces the genus to synonymy under *Corymbites* LATREILLE and the type to synonymy under *Corymbites aeneicollis* OLIVIER. Gemminger and Harold (1869) reduce the type to a variety of *Corymbites virens* SCHRANK.

Diadochus BUYSSON.

1895, Bull. Soc. Ent. France, p. 406.

Type.—*Diadochus antigai* BUYSSON. (Monobasic.)

Diadysis CANDÈZE.

1881, Elat. Nouv., fasc. 3, p. 98.

Type.—*Diadysis morsi* CANDÈZE. (Monobasic.)

[**Dichelonychus** FAIRMAIRE, typ. err.]=**Cratonychus** DEJEAN.
1904, Ann. Soc. Ent. Belgique, vol. 48, p. 235.
Type.—*Elater castanipes* PAYKULL.

NOTE.—Fairmare in 1904. "Ce nouveau genre (*Didymolophus*) parait voysin des *Dichelonychus*. . . . L' insecte type de ce genre resemble plus à certains *Athous* qu'à des *Cratonychus*."

Dicrepidius ESCHSCHOLTZ.
1829, Thon. Arch., vol. 2, pt. 1, p. 31. Five species.
Type.—*Dicrepidius pectinicornis* ESCHSCHOLTZ. (Present designation.)

NOTE.—Gemminger and Harold (1869) reduce the type to synonymy under *Diercpidius ramicornis* PALISOT DE BEAUVOIS.

Dicronychus (Eschscholtz) CASTELNAU.
1833, Dejean, Cat., ed. 3, p. 88. One manuscript species.
1836, Silbermann Rev. Ent., vol. 4, opposite p. 5. (Table, no species.)
1840, Laporte de Castelnau, Hist. Nat. Ins., vol. 1, p. 251. Two species.
Type.—*Dicronychus senegalensis* LAPORTE DE CASTELNAU. (Present designation.)

Dicteniophorus CANDÈZE.
1863, Monogr. Elat., vol. 4, p. 441. Four species.
Type.—*Dicteniophorus fusiformis* CANDÈZE. (Present designation.)

Didymolophus FAIRMAIRE.
1904, Ann. Soc. Ent. Belgique, vol. 48, p. 235.
Type.—*Didymolophus perrieri* FAIRMAIRE. (Monobasic.)

Dilobitarsus LATREILLE.
1834, Ann Soc. Ent. France, vol. 3, p. 142.
Type.—*Dilobitarsus tuberculata* LATREILLE. (Monobasic.)

NOTE.—Candèze (1857) reduces type to synonymy under *D.* (*Elater*) *videns* FABRICIUS.

[**Dima** (Ziegler) DEJEAN]=nomen nudum.
1833, Dejean, Cat., ed. 3, p. 87. One manuscript species.
Type.—*Dima elateroides* (ZIEGLER), manuscript name.

Dima CHARPENTIER.
1825, Hor. Ent., p. 191, pl. 6, fig. 8.
Type.—*Dima elateroides* CHARPENTIER. (Monobasic.)

NOTE.—Eschscholtz in Silbermann Rev. Ent., vol. 4, 1836, mentions the genus in table, no species included.. *Dima elateroides* ZIEGLER (by designation of E. Blanchard, Hist. Nat. Ins., vol. 2, p. 75, 1873) is but a manuscript name.

Dioxypterus FAIRMAIRE.
1881, Naturaliste, p. 406. Four species.
Type.—*Dioxypterus nigrotransversus* FAIRMAIRE. (Present designation.)

[**Diploconus** CANDÈZE, not HAECKEL, 1860, Protozoa]=**Neodiploconus** HYSLOP, new name.
1860, Monogr. Elat., vol. 3, p. 290. Ten species.
Type.—*Diploconus peregrinus* CANDÈZE. (Present designation.)

Diplophoenicus CANDÈZE.
1895, Ann. Soc. Ent. Belgique, p. 68.
Type.—*Diplophoenicus alluaudi* CANDÈZE. (Monobasic.)

Diplostethus SCHWARZ.
1906, Gen. Ins., fasc. 46, p. 258. Four species.
Type.—*Aphanobius setosus* GERMAR, Zeit. f. d. Ent., vol. 5, p. 185, 1844. (Present designation.)

Dipropus GERMAR.

1839, Zeit. f. d. Ent., vol. 1, p. 215. Three species.

Type.—*Elater pexus* GERMAR, Ins. Sp. Nov., p. 55, 1824. (Present designation.)

NOTE.—Candèze (1859) divides this genus, placing part of the species in *Anoplischius* CANDÈZE and the remainder, including the type in *Ischiodontus* CANDÈZE.

Dodecacius SCHWARZ.

1902, Deut. Ent. Zeit., p. 153. Two species.

Type.—*Dodecacius testaceus* SCHWARZ. (Present designation.)

NOTE.—The other species *D. nigricollis* SCHWARZ is described as possibly the female of *D. testaceus* SCHWARZ.

Dodecactenus CANDÈZE.

1889, Elat. Nouv., fasc. 4, p. 36 (102).

Type.—*Dodecactenus staudingeri* CANDÈZE. (Monobasic.)

Dolerosomus MOTSCHULSKY.

1859, Bull. Soc. Imp. Nat. Moscow, vol. 32, pt. 2, p. 382. Three species.

Type.—*Dolerosomus flavipennis* MOTSCHULSKY. (Present designation.)

NOTE.—Candèze (1863) reduces the type to synonymy under *Sericosomus* (*Atractopterus*) *umbraticus* LECONTE (1853).

Dolopiosomus MOTSCHULSKY.

1859 Bull. Soc. Imp. Nat., Moscow, vol. 32, p. 380.

Type.—*Dolopiosomus aterrimus* MOTSCHULSKY. (Monobasic.)

NOTE.—Gemminger and Harold (1869) reduce the genus to synonymy under *Ludius* LATREILLE and the type to synonymy under *Ludius tartareus* LECONTE. O. Schwarz (1906) reduces the type to synonymy under *Trichophorus tartareus* LECONTE.

[Dolopius (ESCHSCHOLTZ) emend.]=**Dalopius** ESCHSCHOLTZ.

1836, Silb. Rev. Ent., opposite p. 5. In table, no species included.

Type.—*Dolopiosomus aterrimus* MOTSCHULSKY. (Monobasic.)

NOTE.—*Elater marginatus* LINNAEUS, type by designation of Westwood, Int. Mod. Class. Ins., vol. 2, Gen. Syn., p. 25, 1840, is not originally included. Candèze (1863) reduces the genus to synonymy under *Sericosomus* REDTENBACHER, and places *Elater marginatus* FABRICIUS in synonymy under *Sericosomus marginatus* LINNAEUS. Gemminger and Harold (1869) reduce the genus to synonymy under *Sericus* ESCHSCHOLTZ.

Doloporus CANDÈZE.

1887, Not. Leyden Mus., vol. 9, p. 289. Two species.

Type.—*Doloporus aterrimus* CANDÈZE. (Present designation.)

Dorcostoma NEWMAN.

1857, Trans. Ent. Soc. London, new ser., vol. 4, p. 52.

Type.—*Elater* (*Dorcostoma*) *jansoni* NEWMAN. (Monobasic.)

NOTE.—Gemminger and Harold (1869) reduce the genus to synonymy under *Aphileus* CANDÈZE, and the type to synonymy under *A. lucanoides* CANDÈZE.

Dorygonus CANDÈZE.

1859, Monogr. Elat., vol. 2, p. 182. Six species.

Type.—*Dorygonus amaurus* CANDÈZE. (Present designation.)

Drasterius Eschscholtz.

1829, Thon. Arch., vol. 2, pt. 1, p. 33. Two species.

Type.—*Elater bimaculatus* Fabricius, Syst. Eleuth., vol. 2, p. 245, 1801. (Designation of Westwood, Int. Mod. Class. Ins., vol. 2, Gen. Syn., p. 25, 1840.)

Note.—Gemminger and Harold (1869) give Rossi (Fauna. Etrusc., vol. 1, p. 182, 1790) as the original author of the type. This is correct, as Fabricus gives Rossi as author of type.

Drepanius Perty=(**Drepranius** O. Schwarz, typographical error).

1830, Delect. Anim. Art., p. 24.

Type.—*Drepanius clavipes* Perty. (Monobasic.)

Note.—Gemminger and Harold (1869) reduce the genus to synonymy under *Physodactylus* Fischer in the Cebrionidae. O. Schwarz (1906) reduces the genus to synonymy under *Physodactylus* Fischer placing this genus in the Elateridae but not including the type. He misspells the generic name *Drepranius*.

[**Drepranius** (Perty) O. Schwarz, typographical error]=**Drepanius** Perty.

1906, Gen. Ins., fasc. 46, p. 311.

Type.—*Drepanius clavipes* Perty.

Dulius Fleutiaux.

1906, Bull Soc. Ent. Paris, p. 199.

Type.—*Dulius aberrans* Fleutiaux. (Monobasic.)

Dysarestus[1] Handlirsch.

1906, Die Fossilen Insect, vol. 1, p. 451, pl. 41, fig. 57.

Type.—*Elaterites vetustus* Heer, Urwelt. d. Schw., vol. 88, p. 95, 1865. (Monobasic.)

Note.—Handlirsch says: "Kann wohl zu den Elateriden gehören, vielleicht zu *Elaterophanes*, etc."

Dysmorphognathus Solier.

1851, Gay, Hist. fis. Chile, Zool., vol. 5, p. 37.

Type.—*Dysmorphognathus fuscus* Solier. (Monobasic.)

Note.—Candèze (1859) reduces the genus to synonymy under *Grammophorus* Solier and says: "L'espèce décrite sous le nom de *D. fuscus* n'est que le mâle de *Grammophorus impressicollis* Solier."

Eanus LeConte.

1861, Class. Coleo. N. A., vol. 1, p. 171. Two species.

Type.—*Limonius estriatus* LeConte, Trans. Amer. Philos. Soc., vol. 10, p. 434, 1853. (Present designation.)

Note.—Candèze (1863) refers the type to *Corymbites* Latreille.

Echthrogaster Blackburn.

1900, Proc. Roy. Soc. Victoria, vol. 12, pt. 2, p. 213.

Type.—*Echthrogaster lugubris* Blackburn. (Monobasic.)

Ectamenogonus Buysson.

1893, Bull. Soc. Ent. France, p. 314. Two species.

Type.—*Ludius montandoni* Buysson, Ann. Soc. Ent. France, p. 202, 1888. (Present designation.)

Note.—Schwarz (1906) reduces the genus to a subgenus of *Elater* Linnaeus and refers to the type as having been originally described as a *Steatoderus*.

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[1] Fossil.

Ectinus Eschscholtz.

1829.—Thon. Arch., vol. 2, pt. 1, p. 34. Two species.

Type.—*Elater volhynensis* Fischer, Entomog. Imp. Russ., vol. 2, p. 212, 1823. (Present designation.)

Note.—*Elater aterrimus* Linnaeus, Syst. Nat., vol. 1, pt. 2, p. 653, 1740, type by designation of Westwood, Int. Mod. Class. Ins., vol. 2, Gen. Syn., p. 25, 1840 was not originally included. Candèze (1860) places the other originally included species *E. aterrimus* Fabricius, Syst. Eleuth., vol. 2, p. 227, 1801, in synonymy under *Athous* (*Elater*) *niger* Linnaeus, Fauna Suec., p. 743, 1746, and later (1863) reduces the type to synonymy under *Agriotes* (*Elater*) *aterrimus* Linnaeus. He recognizes this genus with the single species *Ectinus* (*Elater*) *thesus* Germar, but later (1891) recognizes his error in determining the genus and refers *Ectinus* Candèze to synonymy under *Pittonotus* Kiesenwetter. Gemminger and Harold (1869) reduce the genus to synonymy under *Agriotes* Eschscholtz, and O. Schwarz (1906) reduces it to a subgenus of *Agriotes* Eschscholtz.

Eidolus Candèze.

1857, Monogr. Elat., vol. 1, p. 178.

Type.—*Eidolus linearis* Candèze. (Monobasic.)

[**Elasmocerus** Boheman, not LeConte, 1849, Cleridae]=**Leptophyllus** Hope.

1851, Ins. Caffraria, vol. 1, 2, p. 381.

Type.—*Elasmocerus validicornis* Boheman. (Monobasic.)

Note.—Candèze (1857) reduces the genus to synonymy under *Megalorhipis* Lacordaire, referring *Leptophyllus strachani* Hope to synonymy under *M. validicornis* Lacordaire. Gemminger and Harold (1869) reduce the genus to synonymy under *Leptophyllus* Hope, and the type to synonymy under *L. strachani* Hope.

Elasmosomus Schwarz.

1902, Stettiner Ent. Zeit., p. 212. Seventeen species.

Type.—*Elasmosomus fasciculatus* Schwarz. (Present designation.)

Elastrus Candèze.

1859, Monogr. Elat., vol. 2, p. 433. Three species.

Type.—*Elastrus anchastinus* Candèze. (Present designation.)

Elater Linnaeus=(**Steatoderus** Eschscholtz, isogenotypic).

1758, Syst. Nat., ed. 10, vol. 1, p. 404. Twenty-four species.

Type.—*Elater ferrugineus*[1] [Fabricius]. (Designation of Latreille, Consid. Gén. sur l'Ordre Nat. des Anim., 1810.)

Note.—*Elater brunneus* Linnaeus. Designation Gozis, Recher. Esp. Typ., p. 22, 1886.

[**Elateropsis**[2] Roemer, not Chevrolat, 1862, Cerambycidae]=**Pseudoelateropsis** Handlirsch.

1876, Zeit. deut. geol. Ges., vol. 28, p. 351, fig. 1.

Type.—*Elateropsis infraliassica* Roemer. (Monobasic.)

Elaterites[2] Heer.

1847, Neue Denkschr. allg. Schweiz. Ges. f. Nat., vol. 8, p. 141.

Type.—

Note.—Group name for specifically unrecognizable Elaterid fossils.

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[1] This is synonymous with *Elater ferrugineus* Linnaeus, as Fabricius (1801) refers to this as a Linnean species, as do subsequent writers. There is no *Elater ferrugineus* Fabricius.

[2] Fossil.

Elaterium[1] WESTWOOD.

1854, Quart. Journ. Geol. Soc. London, vol. 10, pp. 387, 393, pl. 14, fig. 1. Three species.

Type.—*Elaterium pronaeus* WESTWOOD. (Present designation.)

Elaterophanes[1] HANDLIRSCH.

1906, Die Fossilen Insect., vol. 1, p. 436. Two species.

Type.—*Elater socius* GIEBEL, Ins. Vorw., p. 91, 1856. (Present designation.)

Elathouina REITTER=(**Athouinus** REITTER, 1905, isogenotypic.)

1905, Bestim. Tab., Heft 56, pp. 12–19 (one species, two synonyms).

Type.—*Athous revelieri* MULSANT, Ann. Soc. Linn. Lyon, p. 416, 1874. (Monobasic.)

Elathous REITTER.

1890, Ent. Nachr., vol. 16, no. 16, p. 247. Two species.

Type.—*Elathous buyssoni* REITTER. (Present designation.)

NOTE.—O. Schwarz (1906) reduces the genus to synonymy under *Leptoschema* HORN.

Elatichrosis HYSLOP, new name=(**Chrosis** CANDÈZE, 1863, not GUENEE, 1845, Lepidoptera).

New name for Chrosis CANDÈZE preoccupied.

Type.—*Chrosis exarata* CANDÈZE.

Elatocoelus HYSLOP, new name=(**Hypocoelus** REITTER, preoccupied).

Type.—*Hypocoelus mathiesseni* REITTER.

Elatrigus REITTER.

1905, Bestim. Tab., Heft 56, p. 10.

Type.—*Tetrigus cyprius* BAUDI, Berl. ent. Zeit., p. 50, 1871. (Monobasic.)

Elatrinus HORN.

1871, Trans. Amer. Ent. Soc., p. 307.

Type.—*Elatrinus anthrax* HORN. (Monobasic.)

Eleuphemus HYSLOP, new name=(**Euphemus** LAPORTE, not RAFINESQUE).

New name for *Euphemus* LAPORTE, preoccupied.

Type.—*Elater quadrimaculatus* OLIVIER.

Elius CANDÈZE.

1859, Monogr. Elat., vol. 2, p. 45.

Type.—*Elius prionocerus* CANDÈZE. (Monobasic.)

NOTE.—Candèze (1859) refers to *Dicrepidius prionocerus* CHEVROLAT (in. litt.).

Enamma[1] HANDLIRSCH.

1906. Die fossilen Insect., vol. 1, p. 451, pl. 41, fig. 54.

Type.—*Enamma striatum* HANDLIRSCH. (Monobasic).

NOTE.—Under this species Handlirsch places cf. *Hydriphilites stygius* GEINITZ, cf. *Elaterites sibericus* GEINITZ, and further says: "Habe keinen Anhaltspunkt zur Bestimmung der Familie."

Eniconyx HORN=(**Enisonyx** CANDÈZE, typ. edd.).

1884, Trans. Amer. Ent. Soc., vol. 12, p. 51. Two species.

Type.—*Eniconyx pullatus* HORN. (Present designation.)

[**Enisonyx** (Horn) CANDÈZE, typographical error]=**Eniconyx** HORN.

1891, Cat. Method. Elat., p. 217.

Type.—*Eniconyx pullatus* HORN.

[**Encploderes** SCHWARZ, not FALDERMANN, 1837, Cerambycidae]=**Centhrostethus** SCHWARZ.

1898, Deut. Ent. Zeit., p. 131.

Type.—*Elater (Conoderus) cuspidatus* KLUG, Ins. Madag., vol. 1, p. 66, 1833. (Monobasic.)

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[1] Fossil.

Enoploderes—Continued.

Note.—Three other species are questionably included. Candèze (1857) refers the type to *Tilotarsus* Germar. O. Schwarz (1906) refers *Tilotarsus cuspidatus* (Klug) Candèze (misdetermination) to synonymy under *T. cinctipes* Germar.

Eopenthes Sharp.

1883, Trans. Roy. Dublin Soc., n. s. vol. 3, p. 153. Seven species.

Type.—*Eopenthes basalis* Sharp. (Present designation.)

[**Eschatroxus** (Candèze) Gemminger and Harold, emend.]=**Heschatroxus** Candèze.

1869, Cat. Coleop., vol. 5, p. 1541.

Type.—*Heschatroxus holosericeus* Candèze.

[**Eschscholtzia** Laporte de Castelnau, not Lessne, 1836, Coelenterata=**Athous** Eschscholtz.

1840, Hist. Nat. Anim. Artic. Col., vol. 1, p. 232.

Type.—*Elater rhombeus* Olivier, Ent., vol. 2, no. 31, p. 22, 1789–1808. (Monobasic.)

Note.—Candèze (1860) reduces the genus to synonymy under *Athous* Eschscholtz.

Esthesopus Eschscholtz.

1829, Thon. Arch., vol. 2, pt. 1, p. 32.

Type.—*Esthesopus castaneus* Eschscholtz. (Monobasic.)

[**Eucamptus** Chevrolat, not Dejean, 1833, Tenebrionidae]=**Semiotus** Eschscholtz.

1834, Col. Mexico, 1re Cent., p. 9. New name for *Pericalus* Chevrolat preoccupied.

Type.—*Eucamptus cuspidatus* Chevrolat. (Monobasic.)

Note.—Candèze (1857) reduces the genus to synonymy under *Semiotus* Eschscholtz.

[**Eudactylus** Salle, not Fitzinger, 1843, Reptilia]=**Platycrepidius** Hyslop, new name.

1855, Ann. Soc. Ent. France, vol. 3, p. 266.

Type.—*Eudactylus wapleri* Salle. (Monobasic.)

Eumoeus Candèze.

1874, Revis. Monogr. Elat., p. 113.

Type.—*Eumoeus murrayi* Candèze. (Monobasic.)

[**Euphemus** Laporte de Castelnau, not Rafinesque, 1815, Mollusca]=**Eleuphemus** Hyslop, new name.

1836, Silbermann, Rev. Ent., vol. 4, p. 7.

Type.—*Elater quadrimaculatus* Olivier, Ent., vol. 2, no. 31, p. 20, 1789–1808. (Monobasic.)

Note.—Castelnau cites the species *Elater fasciatus* Drury (*E. quadrimaculatus* Olivier). Candèze (1857) reduces *E. fasciatus* Drury to synonymy under *E. quadrimaculatus* Fabricius (1791); also referring the Olivier species to synonymy under this head.

Euplastius Schwarz.

1903, Deutsche Ent. Zeit., p. 61. Two species.

Type.—*Euplastius athoides* Schwarz. (Present designation.)

Euplathous Reitter.

1905, Bestim. Tab., Heft 56, pp. 34 and 76. Eight species.

Type.—*Athous canus* Dufour, Bull. Soc. Pau., p. 40, 1843. (Original designation.)

Euthysanius LeConte.

1853, Trans. Amer. Philos. Soc., vol. 10, p. 502.

Type.—*Euthysanius lautus* LeConte. (Monobasic.)

[**Exaeolus** Broun, not Gozis, 1886]=**Brounaeolus** Hyslop, new name.

1893, Man. New Zealand Col., p. 1133. Three species.

Type.—*Exaeolus rufescens* Broun. (Present designation.)

Exaeolus Gozis=(**Heteroderes** Candèze, not Latreille).

1886. Recher. Esp. typ., p. 22, new name for *Heteroderes* Candèze, not Latreille.

Type.—*Heteroderes algirinus* Lucas, Expl. Alg., p. 166, 1879. (Original designation.)

Note.—O. Schwarz (1906) refers the type to *Heteroderes* Latreille.

[**Exophthalmie** Latreille, vernacular name]=**Exophahtlmus** Latreille.

1825, Fam. Nat. Regn. Anim. Paris, p. 249. Two species.

Type.—*Elater linearis* Linnaeus. (Type of *Exophthalmus* Latreille.)

Exophthalmus Latreille.

1829, Cuvier, Règne Anim., vol. 4, p. 456. Three species.

Type.—*Elater linearis* Linnaeus, Syst. Nat. ed. 10, vol. 1, p. 404, 1758. (Present designation.)

Note.—Latreille gives this genus as a synonym of *Campylus* Fischer and in footnote says: " Ce sous-genre comprend *l'Elater linearis* de Linnaeus dont son *Mesomelas* n'est qu'une variété; *l'E. borealis* de Gyllenhal, et son *E. cinctus.*" Candèze (1863) reduces the genus to synonymy under *Campylus* Fischer. O. Schwarz (1906) reduces the genus to synonymy under *Lepturoides* Herbst.

Gambrinus LeConte.

1853, Trans. Amer. Philos. Soc., vol. 10, p. 435.

Type.—*Elater armus* Say, Trans. Amer. Philos. Soc., vol. 6, p. 171, 1839. (Monobasic.)

Note.—Candèze (1860) reduces the genus to synonymy under *Limonius* and the type to synonymy under *Limonius stigma* Herbst.

[**Gastrimargus** Schwarz, not Spix, 1823, Mammalia]=**Margogastrius** Schwarz.

1902, Stettiner Ent. Zeit., p. 309.

Type.—*Gastrimargus schneideri* Schwarz (Monobasic).

Gauroderus Thomson.

1859, Skand, Coleo. vol. 1, p. 104.

Type.—*Elater cinereus* Herbst, Fuessl. Arch., vol. 5, p. 114, 1791. (Monobasic.

Note.—Candèze (1860) refers the type to *Cardiophorus* Eschscholtz. Gemminger and Harold (1869) reduce the genus to synonymy under *Cardiophorus* Eschscholtz.

Genomecus Solier.

1851, Gay, Hist. fis. Chile, Zool., vol. 5, p. 29.

Type.—*Genomecus rubicollis* Solier (Monobasic).

Note.—Candèze (1863) refers the type to *Ludius* Latreille. O. Schwarz (1906) reduces the genus to synonymy under *Steatoderus* Eschscholtz, and refers the type to *Trichophorus* Mulsant.

Geranus Sharp.

1877, Ann. Mag. Nat. Hist., ser. 4, vol. 19, No. 114, p. 480. Five species.

Type.—*Geranus crassus* Sharp. (Present designation.)

Glaphyroptera[1] Heer=(**Glaphropterites** Handlirsch).

1852, Liasinsel., vol. 14, figs. 23–25. Two species.

Type.—*Glaphyroptera depressa* Heer. (By elimination.)

Note.—*Glaphyroptera gehreti* Heer the other species is the monobasic type of *Glaphyropterodes* Handlirsch.

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[1] Fossil.

[**Glaphyropterites**[1] HANDLIRSCH]=**Glaphyroptera** HEER.

1906, Die fossilen Ins., vol. 1, p. 437.

Type.—*Glaphyroptera depressa* HEER, Liasinsel., p. 14, 1852. (Monobasic.)

NOTE.—Isogenotypic with *Glaphyroptera* HEER. Handlirsch says of this genus: "Nach meiner Ansicht handelt es sich eher um eine Elateride als um eine Buprestide."

Glaphyropterodes[1] HANDLIRSCH.

1906, Die fossilen Insect., vol. 1, p. 437.

Type.—*Glaphyroptera gehreti* HEER, Liasinsel., p. 14, 1852. (Monobasic.)

NOTE.—Handlirsch says: "Auch diese Form dürfte eher zu den Elateriden als zu den Buprestiden zu rechnen sein."

Globothorax FLEUTIAUX.

1891, Bull. Soc. Ent. Belgique, p. 232.

Type.—*Globothorax chevrolati* FLEUTIAUX. (Monobasic.)

Glypheus CANDÈZE.

1859, Monogr. Elat., vol. 2, p. 168.

Type.—*Glypheus villosulus* CANDEZE. (Monobasic.)

Glyphochilus CANDÈZE.

1859, Monogr. Elat., vol. 2, p. 180. Two species.

Type.—*Glyphochilus leptus* CANDÈZE. (Present designation.)

NOTE.—*G. tasmanicus* CANDÈZE, the other originally included species, is reduced by the author (Monogr. Elat., vol. 2, p. 523) to synonymy under *Atelopus fervus* ERICHSON.

Glyphonyx CANDÈZE.

1863, Monogr. Elat., vol. 4, p. 451. Eleven species.

Type.—*Glyphonyx gundlachii* CANDÈZE. (Present designation.)

Grammephorus SOLIER=(**Diacantha** SOLIER, not CHEVROLAT, 1834).

1851, Gay, Hist. fis. Chile, Zool., vol. 5, p. 20.

Type.—*Grammephorus rufipennis* SOLIER. (Monobasic.)

[**Grammophorus** (Solier) CANDÈZE, emend.]=**Grammephorus** SOLIER.

1859, Monogr. Elat., vol. 2, p. 417.

Type.—*Grammephorus rufipennis* SOLIER.

Grypathous REITTER.

1905, Bestim. Tab., Heft 56, pp. 34, 92. Thirty-three species.

Type.—*Athous longicollis* OLIVIER, Ent., vol. 2 (31), p. 38, 1790. (Original designation.)

NOTE.—Reitter (1905) described this as a subgenus of *Athous* ESCHSCHOLTZ.

[**Grypocarus** THOMSON]=**Grypocrarus** THOMSON.

1864, Skand. Col., vol. 6, p. 83.

Type.—*Elater haemorrhoidalis* FABRICIUS, Syst. Eleuth., vol. 2, p. 235, 1801. (Monobasic.)

NOTE.—Candèze (1860) refers the type to *Athous* ESCHSCHOLTZ. Gemminger and Harold (1869) reduce the genus to synonymy under *Athous* ESCHSCHOLTZ.

Grypocrarus THOMSON=(**Grypocarus** THOMPSON).

1859, Skand. Col., vol. 1, p. 104.

Type.—*Elater haemorrhoidalis* FABRICIUS. (Monobasic.)

Hadromorphus MOTSCHULSKY.

1859, Bull. Soc. Imp. Nat. Moscow, vol. 32, pt. 2, p. 374. Four species.

Type.—*Hadromorphus similissimus* (MENETRIES) MOTSCHULSKY. (Present designation.)

NOTE.—Gemminger and Harold (1869) reduced the genus to synonymy under *Corymbites* LATREILLE, and the type to synonymy under *Corymbites inflatus* (SAY), correcting the type to *simillimus*.

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[1] Fossil.

[**Hammionus** (Megerle) LATREILLE]=**Lepturoides** HERBST.

1801, Cat. Ins. quae Viennae Austriae. auctionis lege distribuunter.

1823, Dahl, Catalog. Also a sales catalogue.

1827, Latreille, Cuvier Règne Anim., p. 456. Three species.

Type.—*Elater linearis* LINNAEUS. (Present designation.)

NOTE.—Latreille gives as a synonym of *Campylus* FISCHER and in a footnote says: "Ce sous-genre comprend *l'Elater linearis* de Linnaeus, dont son *Mesomelas* n'est qu'une variété; *l'E. borealis* de Gyllenhal, et son *cinctus.*" The Megerle and Dahl papers being but sales catalogues have no status. Isogenotypic with *Lepturoides* HERBST, 1784.

Hapatesus CANDÈZE.

1863, Monogr. Elat., vol. 4, p. 188.

Type.—*Hapatesus hirtus* CANDÈZE. (Monobasic.)

Haplathous REITTER.

1905, Bestim. Tab., Heft 56, pp. 33, 61. Twenty-five species.

Type.—*Athous circumductus* MENETRIES, Cat. Rais., p. 158, 1832. (Original designation.)

NOTE.—O. Schwarz (1906) recognizes this as a subgenus of *Athous* ESCHSCHOLTZ.

[**Haplotarsus** (Stephens) SCUDDER, emend.]=**Aplotarsus** STEPHENS.

1882, Nomen Zool.

Type.—*Elater rufipes* FABRICIUS.

NOTE.—This emendation is correct, as Stephens (1830) in footnote gives derivation of name as Aπλoos.=simplex.

Harminius FAIRMAIRE.

1852, Ann. Soc. Ent. France, p. 80.

Type.—*Harminius castaneus* FAIRMAIRE. (Monobasic.)

NOTE.—Candèze (1891) reduces the genus to synonymy under *Athous* ESCHSCHOLTZ, and the type to synonymy under *A. spiniger* CANDÈZE. O. Schwarz (1906) recognizes the genus as valid.

Heligmus CANDÈZE.

1865, Elat. Nouv., fasc. 1, p. 52.

Type.—*Heligmus glyphoderus* CANDÈZE. (Monobasic.)

[**Hemi(a)rrhaphes** (Candèze) SHARP, emend.]=**Hemirrhaphes** CANDÈZE.

1878, Zool. Record, Ins., p. 70.

Type.—*Hemirrhaphes notabilis* CANDÈZE.

Hemicleus CANDÈZE.

1857, Monogr. Elat., vol. 1, p. 180.

Type.—*Hemicleus caffer* CANDÈZE. (Monobasic.)

Hemicrepidius GERMAR.

1839, Zeit. f. d. Ent., vol. 1, p. 212.

Type.—*Hemicrepidius thomasi* GERMAR. (Monobasic.)

NOTE.—Candèze (1863) reduces the genus to synonymy under *Asaphes* KIRBY and the type to synonymy under *Asaphes memnonius* HERBST.

Hemiolimerus CANDÈZE.

1863, Monogr. Elat., vol 4, p. 227.

Type.—*Hemiolimerus emodi* CANDÈZE. (Monobasic.)

Hemiopinus FAIRMAIRE.

1883, Stettin. Ent. Zeit., vol. 44, p. 365.

Type.—*Hemiopinus hildebrandti* FAIRMAIRE. (Monobasic.)

Hemiops LAPORTE DE CASTELNAU=(**Oxysternus** LATREILLE, not GODET, 1833).

1833, Dejean Cat., ed. 3, p. 95. One manuscript species.

1836, Silbermann, Rev. Ent., vol. 4, p. 15. Two species.

Type.—*Hemiops flava* LAPORTE. (Present designation.)

Hemiopsida MacLeay.

1872, Trans. Ent. Soc. N. S. Wales, vol. 2, p. 261.

Type.—*Hemiopsida mastersi* MacLeay. (Monobasic.)

Hemirhipus Latreille=(**Hemirrhipus** Laporte, emend.).

1829, Fam. Nat. Règne Animal, p. 454 (Paris). Two species.

1825, Fam. Nat. Règne Animal, p. 249 (Paris). Vernacular name *Hemirhipe.*

Type.—*Elater fascicularis* Fabricius, Mant. Ins., p. 171, 1787. (Present designation.)

Note.—Stephens (1830) refers to *E. lineatus* Fabricius as the type, but this species was only cited in the 1825 edition, so has no status in nomenclature.

Hemirrhaphes Candèze.

1878, Elat. Nouv., fasc. 2, p. 32.

Type.—*Hemirrhaphes notabilis* Candèze. (Monobasic.)

Note.—Fleutiaux, Philippine Journ. Sci., vol. 11, No. 3, sec. d., p. 228, 1916; "Le nom de Arrhaphes doit disparaître, étant déjà employé, Arrhaphe Schaeffer 1850, Hémiptère (*Arrhaphus* Kraatz 1860, Coleoptera)." O. Schwarz (1906) reduces the genus to synonymy under *Arhaphes* Candèze.

[**Hemirrhaphus** (Candèze) Schwarz, typ. err.]=**Hemirrhaphes** Candèze.

1898, Deut. Ent. Zeit., p. 148.

Type.—*Hemirrhaphes notabilis* Candèze.

[**Hemirrhipus** (Latreille) Laporte de Castelnau, emend.]=**Hemirhipus** Latreille.

1836, Silbermann's Rev., vol. 4, p. 12.

Type.—*Elater fascicularis* Fabricius.

Heschatroxus Candèze=(**Eschatroxus** Gemminger and Harold, emend.).

1865, Elat. Nouv., fasc. 1, p. 37.

Type.—*Heschatroxus holosericeus* Candèze. (Monobasic.)

Note.—Gemminger and Harold (1869) emend the spelling of this genus to *Eschatroxus.*

Heterathous Reitter.

1905, Bestim. Tab., vol. 5, pt. 56, p. 32.

Type.—*Athous sanguinicollis* Frivaldsky, Term. Fuztek., p. 124, 1892, (Monobasic.)

Note.—O. Schwarz (1906) recognizes this as a subgenus of *Athous* Eschscholtz.

Heterocrepidius Guerin-Meneville.

1838, Mag. Zool., Voyage de la *Favorite*, pp. 23, 24, pl. 229, fig. 1.

Type.—*Elater* (*Dicrepidius*) *ventralis* Guerin. (Monobasic.)

Heteroderes Latreille.

1834, Ann Soc. Ent. France, vol. 3, p. 155.

Type.—*Heteroderes fuscus* Latreille. (Monobasic.)

[**Heteropus** Germar, not Palisot de Beauvois, 1805, Orthoptera]=**Heterocrepidius** Guerin-Meneville.

1839, Zeit. f. d. Ent., vol. 1, p. 217. Two species.

Type.—*Heteropus picipes* Germar. (Present designation.)

Note.—Candèze (1859) reduces the genus to synonym under *Heterocrepidius* Guerin-Menneville.

Heterostethus Schwarz.

1896, Deutsche Ent. Zeit., p. 147.

Type.—*Heterostethus pictus* Schwarz. (Monobasic.)

Note.—O. Schwarz (1906) reduces the genus to synonymy under *Agrypnella* Champion and the type to synonymy under *Agrypnella* (*Cryptohypnus*) *squamifer* Candèze.

Hexaulacus Candèze.
1874, Revis. Monogr. Elat., p. 40.
Type.—*Hexaulacus reedi* Candèze. (Monobasic.)

Hifo Candèze.
1881, Elat. Nouv., fasc. 3, p. 94.
Type.—*Hifo pacificus* Candèze. (Monobasic.)

Hifoides Schwarz.
1906, Gen. Ins., fasc. 46, p. 216.
Type.—*Pyrophorus semiotides* Schwarz, Deut. Ent. Zeit., p. 154, 1906. (Monobasic.)

Homaeolacon Blackburn.
1890, Trans. Roy. Soc. S. Australia, vol. 13, p. 90.
Type.—*Homaeolacon gracilis* Blackburn. (Monobasic.)

Homotechnes Candèze.
1881, Elat. Nouv., fasc. 3, p. 71.
Type.—*Homotechnes corymbitoides* Candèze. (Monobasic.)

[**Homotechnus** (Candèze) O. Schwarz, typ. error.]=**Homotechnes** Candèze.
1906, Gen. Ins., fasc. 46, p. 120.
Type.—*Homotechnes corymbitoides* Candèze.

Horistonotus Candèze.
1860, Monogr. Elat., vol 3, p. 243. Thirty-nine species.
Type.—*Horistonotus flavidus* Candèze. (Present designation.)

Hovactyla Fairmaire.
1901, Rev. Ent., France, vol. 20, p. 174.
Type.—*Hovactyla dermestoides* Fairmaire. (Monobasic.)

Hydriphilites[1] Geinitz.
1884, Zeit. d. Geol. Ges., p. 583.
Type.—*Hydriphilites stygius* Geinitz. (Monobasic.)

Hypnoidus Stephens=(**Scoliocerus** Motschulsky, not Wollaston).
1830, Ill. Brit. Ent. Mand., vol. 3, p. 260. Six species.
Type.—*Elater riparius* Fabricius, Ent. Syst., vol. 2, p. 232, 1775. (Designation of Westwood in Int. Mod. Class. Ins., vol. 2, Gen. Syn., p. 25, 1840.)

Note.—*Hypnoidus quadripustulatus* Fabricius is designated by Gozis, Rech. Esp. Typ., p. 22, 1886, as the type. Candèze (1860) reduces the genus to synonymy under *Cryptohypnus* Eschscholtz.

Hypodesis Latreille.
1834, Ann. Soc. Ent. France, vol. 3, p. 156.
Type.—*Hypodesis sericea* Latreille. (Monobasic.)

Note.—Candèze (1863) cites the type as *Hypodesis sericea* (Latreille) Germar, as Latreille merely mentions the specific name in connection with the generic description, which, however, we must also consider as the specific description.

Hypoganus Kiesenwetter.
1863, Naturg. Ins. Deutschl., vol. 4, p. 299.
Type.—*Elater cinctus* Paykull, Faun. Suec., vol. 3, p. 10, 1800. (Monobasic.)

Note.—Candèze (1863) reduces to synonymy under *Corymbites* Latreille.

[**Hypolithus** Eschscholtz, not Dejean, 1829, Carabidae]=**Cryptohypnus** Eschscholtz.
1829, Thon. Arch., vol. 2, pt. 1, p. 34. Twelve species.
Type.—*Hypolithus littoralis* Eschscholtz. (Present designation.)

Note.—Candèze (1860) reduces the genus to synonymy under *Cryptohypnus* Eschscholtz, with which genus it is isogenotypic.

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[1] Fossil.

Hypsiophthalmus Latreille.

1834, Ann. Soc. Ent. France, vol 3, p. 145. Two species.

Type.—*Pyrophorus luciferus* Eschscholtz. (Elimination.)

Note.—*P. buphthalmus* Eschscholtz, the other originally included species, is the type of *Belania*. Gemminger and Harold (1869) refer *P. luciferus* d'Urville, Dejean's Cat., to synonymy under *dilitatus* Solier, 1851, and reduce the genus to synonymy under *Pyrophorus* Illiger.

[**Ictis** Candèze, not Kaup, 1829 (Mammalia) not Alder and Hancock, 1847 (Mullusca)]=**Pleonomus** Menetries.

1863, Monogr. Elat., vol. 4, p. 240.

Type.—*Ictis sinensis* Candèze. (Monobasic.)

Note.—Candèze (1891) reduces the genus to synonymy under *Pleonomus* Menetries.

Idiotropa Schwarz.

1897, Deut Ent. Zeit., p. 63.

Type.—*Athous henoni* Abeille de Perrin. L'Echange, vol. 10, No. 116, p. 91, 1894. (Monobasic.)

[**Idiotropia** Schwarz, emend.]=**Idiotropa** Schwarz.

1906, Gen. Ins., fasc. 46, p. 314.

Type.—*Athous henoni* Abeille de Perrin.

Note.—Schwarz (1906) gives reference *Idiotropia* Schwarz, Deut. Ent. Zeit., p. 63, 1897, (not *Idiotropia* Schwarz).

Idolus Desbrochers des Loges=(**Logesius** (Gozis) Desbrochers).

1875, Opusc. Ent., p. 42.

Type.—*Idolus breviusculus* Desbrochers des Loges. (Monobasic.)

Note.—O. Schwarz (1906) refers the type to *Drasterius* Eschscholtz as follows: *D. bimaculatus* Rossi *breviusculus* Desbrochers des Loges (Agriotes), 1869.

[**Iphis** Laporte de Castelnau, not Leach, 1817, Crustacea]=**Lycoreus** Candèze

1836, Silbermann, Rev. Ent., vol. 4, p. 8. Six species.

Type.—*Iphis triocellata* Castelnau. (Present designation.)

Note.—Candèze (1857) reduces the genus to synonymy under *Lycoreus* Candèze.

Ischiodontus Candèze.

1859, Monogr. Elat., vol. 2, p. 90. Sixty-three species.

Type.—*Ischiodontus pinguis* Candèze. (Present designation.)

[**Ischius** Candèze, not Wesmael, 1837, Hymenoptera]=**Pyrischius** Hyslop, new name.

1857, Monogr. Elat., vol. 1, p. 195.

Type.—*Ischius gerstaeckeri* Candèze. (Monobasic.)

Ischnodes Germar.

1844, Zeit. f. d. Ent., vol. 5, 180.

Type.—*Elater sanguinicollis* Panzer, Faun. Germ., vol. 6, p. 13, 1793–1809. (Monobasic.)

Note.—Candèze (1859) reduces the genus to synonymy under *Megapenthes* Kiesenwetter, and later (1891) credits Eschscholtz with the genus.

Isidus Mulsant and Rey.

1875, Ann. Soc. Linn. Lyon, new ser., vol. 21, p. 405.

Type.—*Isidus moreli* Mulsant and Rey. (Monobasic.)

[**Isosoma** Menetries, not Bilberg, 1820, Chrysomelidae, not Walker, 1832, Hymenoptera, not Faldermann, 1835, Coleoptera.]=**Menetriesia** Hyslop, new name.

1832, Cat. Rais., p. 160.

Type.—*Isosoma elateroides* Menetries. (Monobasic.)

Itodacnus SHARP.

1885, Trans. Roy. Soc. Dublin. Also includes *Corymbites corruscus* KARSCH. with a query.

Type.—*Itodacnus gracilis* SHARP. (Monobasic.)

NOTE.—O. Schwarz (1906) reduces the genus to synonomy under *Ludius* ESCHSCHOLTZ.

Julodischema THOMSON.

1857, Arch. Ent., vol. 1, p. 164.

Type.—*Julodischema lacordairei* THOMSON. (Monobasic.)

Keleusticus[1] HANDLIRSCH.

1906, Die Fossilen Insect., vol. 1, p. 450, pl. 41, fig. 50.

Type.—*Buprestites zerkelii* GEINITZ, Arch. Ver. Mecklenb., vol. 48, p. 75, fig. 9, 1894. (Monobasic.)

NOTE.—Handlirsch says: "Kann in allerlei Familien gehören, vermutlich aber weder zu den Buprestiden noch zu den Elateriden."

Lacon LAPORTE DE CASTELNAU.

1836, Silbermann, Rev. Ent., vol. 4, p. 11. Three species.

Type.—*Elater atomarius* FABRICIUS, Ent. Syst. Suppl., p. 139, 1798. (Present designation.)

NOTE.—*Elater murinus* LINNAEUS type by designation of Thomson, Skand. Col., vol. 1, 1859, was not an originally included species. All the originally included species are now referred to *Adelocera.*

Legna WALKER.

1858, Ann. Nat. Hist., vol. 3, ser. 2, p. 280.

Type.—*Legna idonea* WALKER. (Monobasic.)

Lepidotus [(Megerle) Eschscholtz] STEPHENS.

1830, Ill. Brit. Ent. Mand., p. 374 in note. Three species.

Type.—*Elater varius* OLIVIER, Ent., vol. 2, pt. 31, p. 32; vol. 3, fig. 26, 1789. (Present designation.)

NOTE.—"My friend J. E. Gray, Esq., informs me that Eschscholtz has recently given a new arrangement of this family, in which he has divided it into several genera, giving types of each; but I have hitherto been unsuccessful in obtaining a view of the work, which Mr. Gray saw in Germany. He also informs me that in another work of the above writer he quotes *E. murinus*, *fasciatus*, and *varius* as belonging to the genus *Lepidotus* MEGERLE." Quoted from Stephens (1830).

Leptophyllus HOPE=(**Elasmocerus** BOHEMAN, not LECONTE, 1849.)

1842, Proc. Zool. Soc. London, p. 79.

Type.—*Leptophyllus strachani* HOPE. (Monobasic.)

NOTE.—O. Schwarz (1906) reduces the genus to a subgenus of *Oxynopterus* HOPE.

Leptoschema HORN.

1884, Trans. Amer. Ent. Soc., vol. 12, p. 50. Three species.

Type.—*Agriotes protractus* HORN, Trans. Amer. Ent. Soc., p. 317, 1871. (Original designation.)

NOTE.—*Athous impressifrons* HAMPE, type by designation of Reitter, Bestim. Tab., Heft 56, p. 23, 1905, was not an originally included species.

Lepturoides HERBST=(**Hammionus** LATREILLE, 1827 isogenotypic)=(**Campylinus** O. SCHWARZ, type. err., 1906)=(**Campylus** FISCHER, 1824, isogenotypic).

1784, Fuessly Archiv., vol. 5, p. 103.

Type.—*Lepturoides linearis* HERBST. (Monobasic.)

NOTE.—Candèze (1863) refers both *linearis* LINNAEUS and *linearis* HERBST to *Campylus* FISCHER.

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[1] Fossil.

Limoniscus REITTER.

1905, Bestim. Tab., Heft 56, pp. 12, 14. Four species.

Type.—*Athous violaceus* MÜLLER, Germ. Mag. Ent., vol. 4, p. 184, 1843. (Present designation.)

Limonius ESCHSCHOLTZ.

1829, Thon. Archiv., vol. 2, pt. 1, p. 33. Nine species.

Type.—*Elater bructeri* FABRICIUS, Syst. Eleuth., vol. 2, p. 243, 1801. (By designation of Westwood, Int. Mod. Class, Ins., vol. 2, Gen. Syn., p. 25, 1840.)

Liotrichus KIESENWETTER.

1863, Naturg. Ins. Deutschl., vol. 4, p. 288. Four species.

Type.—*Elater affinis* PAYKULL, Faun. Suec., vol. 3, p. 12, 1800. (Original designation.)

NOTE.—Candèze (1863) reduces the genus to synonymy under *Corymbites* LATREILLE.

[**Lobaederus** (Guerin) GEMMINGER and HAROLD, typ. err.]=**Loboederus** GUERIN-MENEVILLE.

1869, Cat. Coleo., p. 1514.

Type.—*Loboederus monilicornis* GUERIN-MENEVILLE.

[**Lobederus** (GUERIN) CANDÈZE emend.]=**Loboederus** GUERIN-MENEVILLE.

1859, Monogr. Elat., vol. 2, p. 78.

Type.—*Loboederus monilicornis* GUERIN-MENEVILLE.

NOTE.—Candèze (1859) reduces the type to synonymy under *Lobederus appendiculatus* PERTY.

[**Loboderus** (Guerin-Meneville) GEMMINGER and HAROLD, emend.]=**Loboederus** GUERIN-MENEVILLE.

1869, Cat. Coleo., vol. 5, p. 1514.

Type.—*Loboederus monilicornis* GUERIN-MENEVILLE.

Loboederus GUERIN-MENEVILLE.

1831, Mag. Zool. Ins., vol. 1, No. 9.

Type.—*Loboederus monilicornis* GUERIN-MENEVILLE. (Monobasic.)

Lobotarsus SCHWARZ.

1898, Deutsche Ent. Zeit., p. 131. Six species.

Type.—*Lobotarsus decoratus* SCHWARZ. (Present designation.)

[**Logesius** (GOZIS) DESBROCHERS DES LOGES]=**Idolus** DESBROCHERS.

1875, Cat. Col. France, p. 51. New name for *Metopius* and *Idolus*.

Type.—*Agriotes breviusculus* DESBROCHERS.

NOTE.—Gozis (Rech. Esp. Typ., p. 23, 1886) refers to his catalogue. O. Schwarz (1906) reduces the genus to synonym under *Idolus* DESBROCHERES. As *Idolus* does not appear to be preoccupied, the new name is invalid.

Lomemus SHARP.

1877, Ann. Mag. Nat. Hist., ser. 4, vol. 19, No. 113, p. 411. Eight species.

Type.—*Lomemus pilicornis* SHARP. (Present designation.)

Ludigenus CANDÈZE.

1863, Monogr. Elat., vol. 4, p. 325. Two species.

Type.—*Ludigenus politus* CANDÈZE. (Present designation.)

Ludioctenus FAIRMAIRE.

1893, Ann. Soc. Ent. France, p. 68.

Type.—*Ludioctenus akbesianus* FAIRMAIRE, (Monobasic.)

NOTE.—O. Schwarz (1906) reduces the genus to synonymy under *Tetrigus* CANDÈZE and reduces the type to synonymy under *T. Cyprius* BAUDI.

Ludiophanes[1] WICKHAM.

1916, Bull. Mus. Comp. Zool. Harvard, vol. 60, no. 12, p. 522.

Type.—*Ludiophanes haydeni* WICKHAM. (Original designation.)

Ludioschema REITTER.

1891, Wiener Ent. Zeit., vol. 10, p. 238.

Type.—*Ludioschema emerichi* REITTER. (Monobasic.)

NOTE.—O. Schwarz (1906) reduces the genus to synonymy under *Agonischius* CANDÈZE and reduces the type to synonymy under *A. obscuripes* GYLLENHAL.

[Ludie LATRIELLE, vernacular name]=**Elater** LINNAEUS.

1825, Fam. Nat. Règne Anim. Paris, p. 248.

Type.—*Elater ferrugineus* FABRICIUS. (Monobasic.)

NOTE.—Candèze (1863) refers *Elater ferrugineus* LINNAEUS and FABRICIUS to *Ludius* LATREILLE. Isogenotypic with *Elater*.

Ludius ESCHSCHOLTZ=(**Calosirus** KOENIG, not THOMSON, 1859).

1829, Thon. Archiv., vol. 2, pt. 1, p. 34. Thirty-three species.

Type.—*Elater cupraeus* FABRICIUS, Ent. Syst., p. 212, 1792. (Present designation.)

NOTE.—Candèze (1863) reduces the genus to synonymy under *Corymbites* LATREILLE.

[Ludius LATREILLE, not ESCHSCHOLTZ, 1829]=**Elater** LINNAEUS.

1834, Ann. Soc. Ent. France, vol. 3, p. 154.

Type.—*Elater ferrugineus* FABRICIUS, Syst. Eleuth, vol. 2, p. 225, 1801. (Original designation.)

NOTE.—Isogenotypic with *Elater* LINNAEUS and *Steatoderus* ESCHSCHOLTZ. Gemminger and Harold (1869) give the bibliographical reference as "Fam. Nat., 1825." This is not a description with status, as the name given is *Ludie*, a vernacular name. O. Schwarz (1906) refers the type to *Steatoderus* ESCHSCHOLTZ.

Luzonicus FLEUTIAUX.

1916, Philippine Journ. Sci., vol. 11, No. 3, sec. D, p. 232.

Type.—*Luzonicus bakeri* FLEUTIAUX. (Monobasic.)

Lycoreus CANDÈZE.

1857, Monogr. Elat., vol. 1, p. 206. Five species.

Type.—*Lycoreus regalis* CANDÈZE. (Present designation.)

NOTE.—Gemminger and Harold (1869) reduces the genus to synonymy under *Iphis* CASTELNAU.

[Macrodes (Dejean) CANDÈZE]=**Pleonomus** MENETRIES.

1833, Dejean, Cat., ed. 3, p. 94. One manuscript species.

1863, Candèze, Monogr. Elat., vol. 4, p. 498.

NOTE.—This genus is first connected with a described species in Candeze's Monograph, where it is placed in synonymy under *Pleonomus strictus* Candèze. O. Schwarz (1906) reduces the genus to synonymy under the subgenus *Nomopleus* REITTER, crediting the genus *Macrodes* to Seidlitz, and reduces the type to synonymy under *N. elongatus* BRISOUT, Ann. Soc. Ent. France, p. 388, 1866.

Macromalocera HOPE.

1834, Trans. Ent. Soc. London, vol. 1, p. 13, pl. 1, fig. 3. Two species.

Type.—*Macromalocera caenosa* HOPE. (Present designation.)

NOTE.—Candèze (1863) says in regard to the other originally included species: "Une autre espèce est décrite et figurée par M. Hope (1834) sous le nom de *M. ceramboides;* elle ne diffère de celle-ci que par sa couleur entièrement flave."

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[1] Fossil.

[**Malanathous** Reitter, typ. err.]=**Melanathous** Reitter.

1905, Bestim. Tab., Heft 56, p. 115.

Type.—*Melanathous sequensi* Reitter.

Malmelater[1] Handlirsch.

1908, Die Fossilen Insect., vol. 1, p. 541. Four species.

Type.—*Elater costeri* Weyenbergh, Arch. Mus. Teyler, vol. 2, p. 284, 1869. (Present designation.)

Margogastrius Schwarz=(**Gastrimargus** Schwarz, not Spix, 1823).

1903, Deut. Ent. Zeit., p. 89. New name for *Gastrimargus* Schwarz, preoccupied.

Type.—*Gastrimargus schneideri* Schwarz.

Mecastrus Sharp.

1877, Ann. Mag. Nat. Hist., p. 469. Three species.

Type.—*Mecastrus convexus* Sharp. (Present designation.)

Mecothorax Solier.

1851, Gay, Hist. fis. Chile Zool., vol. 5, p. 22.

Type.—*Mecothorax castanipennis* Solier. (Monobasic.)

Note.—Candèze (1860) reduces the genus to synonymy under *Deromecus* Solier.

Mecynocanthus Hope.

1837, Trans. Ent. Soc. London, vol. 2, pt. 1, p. 53.

Type.—*Mecynocanthus unicolor* Hope. (Monobasic.)

Medonia Candèze.

1860, Monogr. Elat., vol. 3, p. 17.

Type.—*Bedresia punctato-sulcata* Solier, Gay. His. fis. Chile, Zool., vol. 5, p. 25, 1851. (Monobasic.)

Megacentrus[1] Heer.

1852, Liasinsel., pp. 14–15 and 37–38.

Type.—*Megacentrus tristis* Heer. (Monobasic.)

Magacnemis (Eschscholtz) Schwarz, emend.)=(**Megacnemius** Laporte de Castelnau.)=**Tomicephalus** Latreille.

1906, Gen. Ins., fasc. 46, p. 255.

Type.—*Megacnemius sanguinicollis* Latrelle.

Note.—O. Schwarz (1906) reduces the genus to synonymy under *Tomocephalus* Latreille.

[**Megacnemius** (Eschscholtz) Laporte de Castelnau]=**Tomicephalus** Latreille.

1833, Dejean Cat., ed. 3, p. 94. One manuscript name.

1835, Laporte, His. Nat. Ins., vol. 1, p. 239. One species.

1836, Eschscholtz, Silb. Rev. Ent., vol. 4. In table; no species included.

Type.—*Tomicephalus sanguinicollis* Latreille, Ann. Soc. Ent. France, p. 146, 1834. (Monobasic.)

Note.—The genus is isogenotypic with *Tomicephalus* Latreille.

Megalorhipis Lacordiare.

1857, Gen. Coleopt., vol. 4, p. 160.

Type.—*Megalorhipis validicornis* Lacordaire._ (Monobasic.)

Note.—Gemminger and Harold (1869) reduces the type to synonymy under *Leptophyllus strachani* Hope.

Megapenthes Kiesenwetter.

1863, Nat. Ins. Deut., vol. 4, p. 353. Two species.

Type.—*Elater lugens* Redtenbacher, Dissert. inaug. Vinb., p. 11, 1842. (Present designation.)

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[1] Fossil.

Megathous Reitter.

1905, Bestim. Tab., Heft 56, pp. 25 and 27. Eight species.

Type.—*Athous menetricsi* Reitter, Ent. Nach., p. 243, pl. 28, 1890. (Original designation.)

Melanactes LeConte.

1853, Trans. Amer. Philos. Soc., vol. 10, p. 493. Seven species.

Type.—*Melanactes densus* LeConte. (Present designation.)

Melanathous Reitter=(**Malanathous** Reitter, **typ. err.**).

1905, Bestim. Tab., Heft 56, pp. 12–24.

Type.—*Melanathous sequensi* Reitter. (Monobasic.)

Melanotopsis Lewis.

1894, Ann. Nat. Hist., ser. 6, vol. 13, p. 191.

Type.—*Melanotus cete* Candèze, Monogr. Elat., vol. 3, p. 332, 1860. (Designation of Sharp, Zool. Record, 1894, p. 148.)

Note.—O. Schwarz (1906) reduces the genus to synonomy under *Sphenicosomus* Schwarz.

Melanotus (Megerle) Eschscholtz.

1829, Thon. Arch., vol. 2, pt. 1, p. 32. Six species.

Type.—*Elater fusciceps* Gyllenhal, Schönh. Syn. Ins., vol. 3, p. 133, 1817. (Present designation.)

Note.—*Elater fulvipes* Herbst, which is type by designation of Westwood (1840), can not be used as it is the type of *Perimecus* Stephens 1830. Megerle (1801) is but a sales catalogue and has no taxonomic status.

Melanoxanthus Eschscholtz.

1833, Dejean, Cat., ed. 3, p. 91. Three species, two of which are manuscript.

1836, Silbermann's Rev. Ent., vol. 4. In table, no species included.

Type.—*Elater melanocephalus* Fabricius, Syst. Eleuth., vol. 2, p. 239, 1801. (Monobasic.)

Note.—Candèze (1859) reduces the type to synonymy under *E. melanocephalus* Thunberg.

Melanoxus Fleutiaux.

1918, Bull. Soc. Ent. France, p. 194. Two species.

Type.—*Pachyderes africanus* Fleutiaux, Bull. Soc. Ent. France, p. 100, 1901. (Present designation.)

[**Melantho** Laporte de Castelnau, not Bowditch, 1822, Mollusca]=**Crepicardus** Candèze.

1836, Silbermann's Rev. Ent., vol. 4, p. 10. Two species.

Type.—*Melantho klugii* Castelnau. (Present designation.)

Note.—Dejean (1833) erects *Crepicardus* for the manuscript species *Crepicardus miles* Dejean. Candèze (1857) reduces *Melantho costicollis* Laporte and *Crepicardus miles* Dejean to synonymy under *Melantho klugii* Castelnau.

Melanthoides Candèze.

1865, Elat. Nouv., fasc. 1, p. 23.

Type.—*Melanthoides latimanus* Candèze, (Monobasic.)

Menetriesia Hyslop, new name=(**Isosoma** Menetries, not Bilberg, 1820).

New name for **Isosoma** Menetries, preoccupied.

Type.—*Isosoma elateroides* Menetries.

Meristhus Candèze.

1857, Monogr. Elat., vol. 1, p. 162. Four species.

Type.—*Meristhus scrobinula* Candèze. (Present designation.)

Meroplinthus Candèze.
1891, Cat. Method. Elat., p. 163. Four species.
Type.—*Pyrophorus trinotatus* Candèze, Elat. Nouv., fasc. 3, p. 91, 1881. (Present designation.)

Metablax Candèze=(**Blax** Candèze, not Thomson, 1860).
1869, Harold, Col., Heft 5, p. 122. (New name for *Blax* Candèze, preoccupied.)
Type.—*Elater acutipennis* White.

Metanomus Buysson.
1887, Bull. Soc. Ent. France, ser. 6, vol. 7, p. 132.
Type.—*Corymbites* (*Pristolophus*) *montivagus* Rosenhauer, Ins. Faun. Europ., vol. 1, p. 15, 1847. (Monobasic.)

[**Metopius** Desbrochers des Loges, not Panzer, 1806, Hymenoptera]=**Idolus** Desbrochers.
1870, L' Abeille, vol. 7, p. 122.
Type.—*Agriotes breviusculus* Desbrochers. (Monobasic.)
Note.—Isogenotypic with *Idolus* Desbrochers.

Metriaulacus Schwarz.
1901, Deutsche Ent. Zeit., p. 198.
Type.—*Metriaulacus nigrolaterus* Schwarz. (Monobasic.)

Micrelaterium[1] Handlirsch.
1906–1908, Die Fossilen Insect., vol. 1, p. 554, pl. 45, fig. 37.
Type.—*Elaterium triopas* Westwood, Quar. Journ. Geol. Soc., vol. 10, p. 389, 1854. (Monobasic.)

Microdesmes Candèze.
1881, Elat. Nouv., fasc. 3, p. 99.
Type.—*Cardiophorus mastersi* MacLeay, Trans. New South Wales, vol. 3, p. 258. (Monobasic.)

Microglyphonyx Champion.
1896, Biol. Centr. Amer. Col., vol. 3, p. 549.
Type.—*Microglyphonyx coarctatus* Champion. (Monobasic.)
Note.—O. Schwarz (1906) reduces the genus to a subgenus of *Glyphonyx* Candèze.

Mimelater[1] Handlirsch.
1906, Die Fossilen Insect., vol. 1, p. 449.
Type.—*Elater angulatus* Giebel, Ins. Vorw., vol. 92, 1856. (Monobasic.)
Note.—Handlirsch remarks: "Möglicherweise eine Elateride."

Mocquerysia Fleutiaux.
1899, Bull. mus. Hist. Nat. Paris, p. 369. Two species.
Type.—*Mocquerysia bicolor* Fleutiaux. (Present designation.)

Monadicus Candèze.
1860, Monogr. Elat., vol. 3, p. 52. Three species.
Type.—*Monadicus mobiliceps* Candèze. (Present designation.)

Monelasmus Candèze.
1863, Monogr. Elat., vol. 4, p. 332. Four species.
Type.—*Monelasmus guyanensis* Candèze. (Present designation.)

Monocrepidius Eschscholtz.
1829, Thon. Archiv., vol. 2, pt. 1, p. 32. Nine species.
Type.—*Monocrepidius pallipes* Eschscholtz. (Present designation.)

Morostoma Candèze.
1879, Cist. Ent., vol. 2, p. 485.
Type.—*Morostoma palpale* Candèze. (Monobasic.)

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[1] Fossil.

Myrmodes Candèze.
1857, Monogr. Elat., vol. 1, p. 168.
Type.—*Myrmodes akidiformis* Candèze. (Monobasic.)

Negastrius Thomson.
1859, Skand. Col., vol. 1, p. 106.
Type.—*Elater pulchellus* Linnaeus, Syst. Nat., vol. 1, p. 656, 1758. (Monobasic.)

Note.—*Elater quadripustulatus* Fabricius, type by designation of Sharp, Zool. Record, 1864, Ins., p. 389, was not originally included.

Nemasoma Solier.
1851, Gay, Hist. fis. Chile. Zool., vol. 5, p. 10.
Type.—*Nemasoma sulcatum* Solier. (Monobasic.)

Neodiploconus Hyslop, new name=(**Diploconus** Candèze, not Haeckel, Protozoa, 1860.)
New name for *Diploconus* Candèze preoccupied.
Type.—*Diploconus peregrinus* Candèze.

Neopristilophus Buysson.
1906, Heyden Cat., p. 389. (One species, one variety, one synonym.)
Type.—*Elater depressus* Germar, Fauna Ins., vol. 7, p. 9, 1822. (Monobasic.)

Note.—Buysson reviewed the Elateridae in this catalogue and here erected this genus.

Neotrichophorus Jacob=(**Trichophorus** Mulsant, not Temminck, 1838).
1913, Kafer Russ., vol. 10, p. 742. New name for *Trichophorus* Mulsant, preoccupied.
Type.—*Trichophorus guillebelli* Mulsant. (Type of *Trichophorus* Mulsant.)

Nomopleus Reitter.
1891, Cat. Col., p. 210.
Type.—*Pleonomus strictus* Candèze, Monogr., vol. 4, p. 498, 1863. (Monobasic.)

Note.—*Athous elongatus* Brisout de Barneville, 1866, Ann. Soc. Ent. France, p. 388 (designation of Reitter, Bestim. Tab., Heft 56, p. 33, 1905), is synonymous with *Pleonomus strictus* Candèze 1863.

Nothodes LeConte.
1861, Class. N. A. Coleo., pt. 1, p. 171.
Type.—*Limonius dubitans* LeConte, Trans. Amer. Philos. Soc., vol. 10, p. 433, 1853. (Monobasic.)

Nycterilampus Montrouzier.
1860, Ann. Soc. Ent. France, p. 258.
Type.—*Nycterilampus lifuanus* Montrouzier. (Monobasic.)

Nycterolampus Fleutiaux.
1891, Ann. Soc. Ent. France, p. 391. Three species.
Type.—*Nycterolampus velutinus* (Fauvel) Fleutiaux. (Present designation.)

Ochosternus Candèze.
1863, Monogr. Elat., vol. 4, p. 445. Two species.
Type.—*Elater* (*Limonius*) *zealandicus* White (Zool. of Voy. *Erebus* and *Terror*, p. 7, 1846). (Present designation.)

Note.—Candèze (1863) reduces another species of White, *Elater* (*Ctenicerus*) *punctithorax* White (1846) to synonymy under the above type. O. Schwarz (1906) refers the other originally included species, *O. parryi* Candèze, to the genus *Thoramus* Sharp.

Ocneus Candèze.
1857, Monogr. Elat., vol. 1, p. 84.
Type.—*Ocneus limbatus* Candèze. (Monobasic.)

Octinodes CANDÈZE.
1863, Monogr. Elat., vol. 4, p. 487.
Type.—*Octinodes capillatus* CANDÈZE. (Monobasic.)

Octocryptus CANDÈZE=(**Otocryptus** SHARP, typ. err.).
1892, Ann. Soc. Ent. Belgique, p. 486.
Type.—*Octocryptus cardoni* CANDÈZE. (Monobasic.)

Odontoderus SCHWARZ.
1894, Deutsche Ent. Zeit., p. 149.
Type.—*Odontoderus spinicollis* SCHWARZ. (Monobasic.)

Odontonychus CANDÈZE.
1896, Elat. Nouv., fasc. 6. p. 26.
Type.—*Odontonychus granulatus* CANDÈZE. (Monobasic.)

Oedostethus LECONTE.
1853, Trans. Amer. Philos. Soc., vol. 10, p. 489.
Type.—*Oedostethus femoralis* LECONTE. (Monobasic.)

[**Oedosthetus** (LeConte) MARSHALL, typ. err.]=**Oedostethus** LECONTE.
1873, Nomen. Zool., p. 224.
Type.—*Oedostethus femoralis* LECONTE.

Oestodes LECONTE.
1853, Trans. Amer. Philos. Soc., vol. 10, p. 424. Two species.
Type.—*Elater tenuicollis* RANDALL, Boston Journ. Nat. Hist., vol. 2, p. 14, 1838. (Present designation.)

NOTE.—Candèze (1863) reduces the other originally included species, *O. gracilliformis* RANDALL, to a variety of the type.

Oistus CANDÈZE.
1857, Monogr. Elat., vol. 1, p. 338. Two species.
Type.—*Oistus cacicus* CANDÈZE. (Designation, Hyslop, Proc. Ent. Soc. Wash., vol. 19, p. 128, 1917.)

[**Olaus** FAIRMAIRE]=**Alaus** ESCHSCHOLTZ.
1878, Pet. Nouv., vol. 2, no. 208, p. 279.
Type.—*Olaus costulicollis* FAIRMAIRE, Ann. Soc. Ent. France, 1881. (Monobasic.)

NOTE.—Sharp, Zool. Record, 1878, Ins., p. 73, says this is a typographical error.

Oligostethius SCHWARZ.
1906, Gen. Ins., fasc. 46, p. 314.
Type.—*Idiotropia capensis* SCHWARZ, Deut. Ent. Zeit., p. 357, 1903. (Monobasic.)

Olophoeus CANDÈZE.
1859, Monogr. Elat., vol. 2, p. 15.
Type.—*Olophoeus gibbus* CANDÈZE. (Monobasic.)

Olotelus SOLIER.
1851, Gay, Hist. fis. Chile, Zool., vol. 5, p. 34. Two species.
Type.—*Olotelus femoralis* SOLIER. (Present designation.)

Oophorus ESCHSCHOLTZ.
1833, Dejean Cat., ed. 3, p. 93. Eighteen species (two synonyms), 16 of which are manuscript.
1836, Silbermann Rev. Ent., vol. 6. In table, no species included.
Type.—*Elater elegans* FABRICIUS, Ent. Syst., vol. 1, pt. 2, p. 230, 1775. (Present designation.)

NOTE.—Subsequent writers have referred the type of this genus to *Acolus* ESCHSCHOLTZ.

Ophidius CANDÈZE.
1863, Monogr. Elat., vol. 4, p. 203. Three species.
Type.—*Ophidius elegans* CANDÈZE. (Present designation.)

Optaleus CANDÈZE.
1857, Monogr. Elat., vol. 1, p. 86. Four species.
Type.—*Optaleus limbatus* CANDÈZE. (Present designation.)

Orithales KIESENWETTER.
1863, Naturg. Ins. Deutschl., vol. 4, p. 287.
Type.—*Elater serraticornis* PAYKULL, Faun. Suec., vol. 3, p. 21, 1800. (Monobasic.)
NOTE.—Subsequent writers have followed Kiesenwetter in considering this a subgenus of *Ludius* ESCHSCHOLTZ (*Corymbites* LATREILLE).

Orthathous REITTER.
1905, Bestim. Tab., 56, pp. 34, 80. Nineteen species.
Type.—*Athous jejunus* KIESENWETTER, Naturg. Ins. Deut., vol. 2, p. 326, 1858. (Original designation.)

Orthostethus LACORDAIRE.
1857, Gen. Col., vol. 4, p. 217.
Type.—*Aphanobius infuscatus* GERMAR, Zeit. f. d. Ent., vol. 5, p. 183, 1844. (Original designation.)

Osorno CANDÈZE.
1881, Elat. Nouv., fasc. 3, p. 100.
Type.—*Osorno ambiguus* CANDÈZE. (Monobasic.)

[**Otocryptus** (Candèze) SHARP, typ. err.]=**Octocryptus** CANDÈZE.
1892, Zool. Rec., p. 128.
Type.—*Octocryptus cardoni* CANDÈZE.

Ovipalpus SOLIER.
1851, Gay. Hist. fis. Chile, Zool., vol. 5, p. 9.
Type.—*Ovipalpus pubescens* SOLIER. (Monobasic.)

[**Oxycleidius** ESCHSCHOLTZ nomen nudum]=**Cyathodera** BLANCHARD.
1833, Dejean Cat., ed. 3, p. 89. One manuscript name.
1836, Silbermann, Rev. Ent., vol. 6. (No species.)
Type.—*Cyathodera longicornis* BLANCHARD, Voy. d. Orb., p. 130.
NOTE.—Gemminger and Harold (1869) reduce the Dejean manuscript species *O. nigriceps* to synonomy under the above type.

[**Oxyclidius** (Eschscholtz) SCUDDER emend.]=(**Oxycleidius** ESCHSCHOLTZ)=**Cyathodera** BLANCHARD.
1882, Nomen. Zool., p. 226.
Type.—*Cyathodera longicornis* BLANCHARD.

Oxygonus LECONTE.
1863, List. Col. N. A., p. 48.
Type.—*Elater obesus* SAY, Journ. Acad. Nat. Sci. Philad., vol. 3, p. 168. 1823. (Monobasic.)
NOTE.—Candèze (1863) reduces the type to synonomy under *Agriotes mancus* SAY, but later (1891) recognizes the genus and type as valid.

Cxylasma BROUN.
1881, Man. New Zealand Col., p. 679. Two species.
Type.—*Oxylasma pannosum* BROUN. (Original designation.)

Oxynopterus HOPE.
1842, Proc. Zool. Soc. London, p. 76. Four species.
Type.—*Elater mucronatus* OLIVIER, Journ. Hist. Nat., vol. 1, p. 262, 1792. (Designation Candèze, Monogr., vol. 1, 355, 1857.)

[**Oxysternus** LATREILLE, not GODET, 1833, Histeridae]=**Hemiops** LAPORTE.
1834, Ann. Soc. Ent. France, vol. 3, p. 164. Three species, two of which are manuscript names.
Type.—*Elater crassus* GYLLENHAL, Schönherr, Syn. Ins. App., p. 135, 1817. (Monobasic.)
NOTE.—Candèze (1891) reduces the genus to synonymy under *Plectrosternus* LACORDAIRE, and the type he refers to *Hemiops* LAPORTE.

[Oxysthetus (Fairmaire) Candèze, typ. err.]=**Oxystethus** Fairmaire.
1891, Cat. Method., p. 102.
Type.—*Oxystethus scapulatus* Fairmaire.

Oxystethus Fairmaire.
1882, Le Naturaliste, vol. 5, p. 238.
Type.—*Oxystethus scapulatus* Fairmaire. (Designation of Sharp, Zool. Record, 1882, Ins., p. 77.)

Pachyderes Guerin-Meneville.
1829–1844, Icon. Règne Anim., vol. 3, fasc. 4, p. 41, pl. 12, fig. 5.
Type.—*Pachyderes ruficollis* Guerin-Meneville. (Monobasic.)

Note.—Most writers credit this genus to Latreille, Ann. Soc. Ent. France, p. 149, 1834, Latreille, however, gives the above citation, while Guerin says, "Latrielle, a trés bein exposé les charactères de notre genre (1834). L'espéce est nouvelle . . . ." The plates were evidently distributed before the text was published and Latreille described the genus from the figure.

Pachyelater Lesne=(**Parelater** Lesne, not Candèze, 1881).
1897, Bull. Soc. Ent. France, p. 117. New name for *Parelater* Lesne, preoccupied.
Type.—*Parelater madagascariensis* Lesne. (Type of *Parelater* Lesne.)

Panspaeus Sharp.
1877, Ann. Mag. Nat. Hist., ser. 4, vol. 19, No. 113, p. 409.
Type.—*Panspaeus guttatus* Sharp. (Monobasic.)

Pantolamprus Candèze.
1859, Monogr. Elat., vol. 2, p. 16. Two species.
Type.—*Pantolamprus nitens* Candèze. (Present designation.)

Parablax Schwarz.
1906, Deutsche Ent. Zeit., p. 368. Three species.
Type.—*Metablax trisulcatus* Schwarz. (Present designation.)

Parabuprestium[1] Handlirsch.
1906–1908, Die Fossilen Insect., vol. 1, p. 554, pl. 45, fig. 38. Two species.
Type.—*Buprestium teleas* Westwood, Quart. Journ. Geo. Soc., vol. 10, pp. 386, 395, 1854. (Present designation.)

Note.—Handlirsch says: "Kann zu den Elateriden oder Buprestiden gehören."

Paracardiophorus Schwarz.
1895, Deutsche Ent. Zeit., p. 59. Ten species.
Type.—*Cardiophorus musculus* Erichson, Germar's Zeit., vol. 1, p. 299, 1840. (Present designation.)

Paracosmesus Schwarz=(**Pomachilioides** Schwarz, not Candèze).
1901, Deutsche Ent. Zeit., p. 38. New name for *Pomachilioides* Schwarz, preoccupied.
Type.—*Pomachilioides cruciatus* Schwarz.

Paracrepidomenus Schwarz.
1906, Deutsche Ent. Zeit., p. 364. Three species.
Type.—*Paracrepidomenus fasciculatus* Schwarz. (Present designation.)

Paradoxon Fleutiaux.
1903, Bull. Soc. Ent. France, p. 107.
Type.—*Paradoxon antennale* Fleutiaux. (Monobasic.)

Paragrilium[1] Handlirsch.
1906–8, Die fossilen Insect., vol. 1, p. 553, pl. 45, fig. 34.
Type.—*Elaterium barypus* Westwood, Quart. Journ. Geol. Soc., vol. 10, pp. 389, 394, 1854. (Monobasic.)

Note.—Handlirsch says: "Kann ebensogut zu den Buprestiden als zu den Elateriden gehören."

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[1] Fossil.

[**Par(a)hemiops** (Candèze) SHARP, emend.]=**Parhemiops** CANDÈZE.
1878, Zool. Rec., Ins., p. 70.
Type.—*Parhemiops palliata* CANDÈZE.

Paralacon REITTER.
1905, Bestim. Tab., Heft. 56, p. 6.
Type.—*Lacon cinnamomeus* CANDÈZE, Revis. Monogr., vol. 1, p. 76, 1875. (Monobasic.)

Parallelostethus SCHWARZ.
1906, Gen. Ins., fasc. 56, p. 258. Six species.
Type.—*Elater attenuatus* SAY, Ann. Lyc. N. Y., vol. 1, pt. 2, p. 257, 1825. (Present designation.)

Parallotrius CANDÈZE.
1878, Elat. Nouv., fasc. 2, p. 45.
Type.—*Parallotrius pallipes* CANDÈZE. (Monobasic.)

NOTE.—*Hypodesis pallipes Philippi* believed by Candèze to be merely a manuscript name and referred to synonymy.

Paranilicus CANDÈZE.
1878, Elat. Nouv., fasc. 2, p. 47. Two species.
Type.—*Paranilicus macleayi* CANDÈZE. (Present designation.)

Paranius CHAMPION.
1895, Biol. Centr. Amer., Col., vol. 3, p. 404.
Type.—*Paranius mexicanus* CHAMPION. (Monobasic.)

[**Paranomus** KISENWETTER, not CHAUDOIR, 1842, Carabidae]=**Ludius** ESCHSCHOLTZ.
1863, Naturg. Ins. Deutschl., vol. 4, p. 303. Three species.
Type.—*Diacanthus guttatus* GERMAR, Fauna Ins. Europ., fasc. 21, pl. 5, 1817. (Present designation.)

NOTE.—Candèze (1863) reduced the genus to synonymy under *Corymbites* LATREILLE. O. Schwarz (1906) reduced the genus to synonymy under *Ludius* ESCHSCHOLTZ.

Paraphileus CANDÈZE.
1881, Elat. Nouv., fasc. 3, p. 92.
Type.—*Aphanobius thoreyi* GERMER, Zeit. f. d. Ent., vol. 5, p. 188, 1844. (Monobasic.)

Parapomachilius SCHWARZ.
1900, Deutsche. Ent. Zeit., p. 339. Two species.
Type.—*Parapomachilius incertus* SCHWARZ. (Present designation.)

Parasaphes CANDÈZE.
1881, Elat. Nouv., fasc. 3, p. 101.
Type.—*Parasaphes elegans* CANDÈZE. (Monobasic.)

Parelater CANDÈZE.
1881, Elat. Nouv., fasc. 3, p. 70.
Type.—*Elater coccineus* CANDÈZE, Elat. Nouv., fasc. 1, p. 29, 1865. (Monobasic.)

[**Parelater** LESNE, not CANDÈZE, 1881]=**Pachyelater** LESNE.
1897, Bull. Soc. Ent. France, p. 102.
Type.—*Parelater madagascariensis* LESNE. (Monobasic.)

Parhemiopinus SCHWARZ.
1903, Deutsche. Ent. Zeit., p. 376.
Type.—*Parhemiopinus nigripennis* SCHWARZ. (Monobasic.)

Parhemiops CANDÈZE.
1878, Elat. Nouv., fasc. 2, p. 53.
Type.—*Parhemiops palliata* CANDÈZE. (Monobasic.)

Parinus Sharp.
1877, Ann. Mag. Nat. Hist., vol. 19, ser. 4, No. 114, p. 478.
Type.—*Parinus villosus* Sharp. (Monobasic.)

Pectocera Hope.
1842, Proc. Zool. Soc. London, p. 79. Two species.
Type.—*Pectocera cantori* Hope. (Present designation.)

[**Pedetes** Kirby, not Illiger, 1811, Mammalia]=**Agriotes** Eschscholtz.
1837, Fauna Bor. Amer., vol. 4, p. 145. Two species.
Type.—*Elater obscurus* Linnaeus, Syst. Nat., vol. 1, pt. 2, p. 655, 1758. (Original designation.)

Note.—Subsequent writers have reduced this genus to synonymy under *Athous* Eschscholtz and *Hemicrepidius* Germar, but all agree in referring the type to *Agriotes*.

Penia Hope.
1831, Synop. Ins. Nepaul, Gray's Zool. Misc., pp. 21–23.
Type.—*Penia eschscholtzi* Hope. (Monobasic.)

Note.—Generally recognized as a Laporte de Castelnau genus even so cited by Hope (1831), but evidently in literature not being published by this author until 1836. Silbermann, Rev. Ent., vol. 4, p. 11.

Pericallus Lepelletier and Serville.
1825, Encycl. Method, vol. 10, pt. 2, p. 594. Four species.
Type.—*Elater ligneus* Fabricius, Ent. Syst., vol. 2, p. 219, 1775. (Present designation.)

[**Pericalus** (Lepelletier and Serville) Dejean, emend., not MacLeay, 1825, Carabidae]=(**Eucamptus** Chevrolat, not Dejean, 1833)=**Semiotus** Eschscholtz.
1833, Cat., ed. 3, p. —.
Type.—*Eucamptus cuspidatus* Chevrolat.

Pericus Candèze.
1857, Monogr. Elat., vol. 1, p. 167.
Type.—*Pericus nitidus* Candèze. (Monobasic.)

[**Perimeces** (Stephens) Scudder, emend.]=(**Perimecus** Stephens)=**Melanotus** Eschscholtz.
1882, Nomen. Zool., p. 253.
Type.—*Elater fulvipes* Herbst.

[**Perimecus** (Dillwyn) Stephens]=**Melanotus** Eschscholtz.
1830, Ill. Brit. Ent., vol. 3, p. 263.
Type.—*Elater fulvipes* Herbst, Kafer, vol. 10, p. 46, 1806. (Monobasic.)

Perrinellus Buysson.
1899, Bull. Soc. Ent. France, p. 282. Three species.
Type.—*Athous argentatus* Abeille de Perrin. (Original designation.)

[**Perinellus** (Buysson) O. Schwarz, emend.]=**Perrinellus** Buysson.
1906, Gen. Ins., fasc. 46, p. 172.
Type.—*Athous argentatus* Abeille de Perrin.

Perissarthron Hyslop.
1918, Trans. Ent. Soc. Wash., Oct., vol. 19, p. 1.
Type.—*Corymbites trapezium* LeConte, Proc. Acad. Nat. Sci., Philadl., vol. 18, p. 392, 1866. (Monobasic.)

[**Phamophorus** (Solier) O. Schwarz, typ. err.]=**Phanophorus** Solier.
1906, Gen. Ins., fasc. 46.
Type.—*Phanophorus parallelus* Solier.

Phanophorus Solier=(**Phamophorus** Schwarz, typ. err.).
1851, Gay, Hist. fis. Chile, Zool., vol. 5, p. 26. Three species.
Type.—*Phanophorus parallelus* Solier. (Present designation.)

Phedomenus Candèze.

1889, Elat. Nouv., fasc. 4, p. 23 (89). Three species.

Type.—*Phedomenus venustus* Candèze. (Present designation.)

[**Pheletes** Kiesenwetter]=**Limonius** Eschscholtz.

1863, Naturg. Ins. Deutschl., vol. 4, p. 328.

Type.—*Elater bructeri* Fabricius, Syst. Eleuth., vol. 2, p. 243, 1801. (Original designation.)

Note.—Isogenotypic with *Limonius* Eschscholtz.

[**Philetes** (Kiesenwetter) Thompson, typ. err.]=(**Pheletes** Kiesenwetter)=**Limonius** Eschscholtz.

1859, Skand. Col., vol. 1, p. 105.

Type.—*Elater bructeri* Fabricius.

Phisorhinus (Klug) Candèze.

1859, Monogr. Elat., vol. 2, p. 523.

Type.—*Physorhinus dubius* Klug, Monatsb. d. Berl. Acad., p. 647, 1855. (Monobasic.)

Note.—Candèze by misspelling the generic name and separating the species from *Physorhinus* erected a new genus.

Phorotarsus Motschulsky.

1859, Bull. Soc. Nat. Moscou., vol. 32, pt. 2, p. 358. In table, no species.

1861, Bull. Soc. Nat. Moscou., vol. 34, pt. 1, p. 120.

Type.—*Phorotarsus picturatus* Motschulsky. (Monobasic.)

Photophorus Candèze.

1863, Monogr. Elat., vol. 4, p. 72. Two species.

Type.—*Photophorus jansonii* Candèze. (Present designation.)

[**Phyllophorus** Hope, not Grube, 1840, Echinodermata]=**Charitophyllus** Lacordaire.

1842, Proc. Zool. Soc. Lond., p. 73.

Type.—*Elater gigas* Fabricius, Syst. Eleuth., vol. 2, p. 291, 1801. (Monobasic.)

Note.—Isogenotypic with *Charitophyllus* Lacordaire.

Physodactylus Fischer.

1823, Mem. Soc. Nat. Moscou., vol. 6, p. 301.

Type.—*Physodactylus henningi* Fischer. (Monobasic.)

Physorhinus (Eschscholtz) Germar=(**Physorrhinus** (Eschscholtz) Schwarz emend.).

1833, Dejean Cat., ed. 3, p. 86. Two manuscript species.

1836, Silbermann, Rev. Ent., vol. 4. In table without species.

1840, Germar, Zeit. f. d. Ent., vol. 2, p. 245. One species.

Type.—*Physorhinus xanthocephalus* Germar. (Monobasic.)

[**Physorrhinus** (Eschscholtz) O. Schwarz, emend.]=**Physorhinus** Eschscholtz.

1906, Gen. Ins., fasc. 46, p. 131.

Type.—*Physorhinus xanthocephalus* Germar.

Piezophyllus Hope=(**Cladocerus** Dupont, 1869, not Rafinesque, 1819).

1842, Proc. Zool. Soc., London, p. 76. Two species.

Type.—*Piezophyllus spencei* Hope. (Present designation.)

Pittonotus Kiesenwetter.

1862, Schaum, Cat., p. 58.

Type.—*Elater thesus* Germar, Reise. nach. Dalmat., p. 218, pl. 10, fig. 5, 1817. (Monobasic.)

Pityobius LeConte=(**Calocerus** (Westwood)) Candèze.

1853, Trans. Amer. Philos. Soc., vol. 10, p. 428.

Type.—*Pityobius anguinus* LeConte. (Monobasic.)

Plastelater[1] HANDLIRSCH.
1906–1908, Die fossilen Ins., vol. 1, p. 438, pl. 41, fig. 6.
Type.—*Elater neptuni* GIEBEL, Ins. Vorw., 91, 1856. (Monobasic.)
NOTE.—"Wenn der Prothorax ganz erhalten ist, so kann man diese Form wohl nicht zu den Elateriden stellen, eher zu den Buprestiden."

[**Plastocerus** LECONTE, not SCHAUM, 1852, Rhippoceridae]=**Octinodes** CANDÈZE.
1853, Trans. Amer. Philos. Soc., vol. 10, p. 502.
Type.—*Plastocerus schaumii* LECONTE. (Monobasic.)

Platycrepidius Candèze=(**Eudactylus** SALLÉ, not FITZINGER).
1859 Monogr. Elat., vol. 2, p. 159, ten species.
Type.—*Eudactylus waplcri* SALLÉ. (Present designation.)
NOTE.—I have given as new name for *Eudactylus* SALLÉ a name suggested by Germar (in. litt.) and published by Candèze, Monogr., vol. 2, 1859, as a synonym of *Eudactylus* SALLÉ.

[**Platicrepidius** MOTSCHULSKY, nomen nudum.]
1859, Bull. Soc. Nat. Moscou., vol. 32, pt. 2, 358. In table without species.
NOTE.—Motschulsky evidently had reference to the manuscript name *Platycrepidius* GERMAR.

Platynychus MOTSCHULSKY.
1858, Etudes Ent., vol. 7, p. 58. Seven species.
Type.—*Platynychus indicus* MOTSCHULSKY. (Present designation.)

[**Plectosternus** (Lacordaire) O. SCHWARZ, typ. err.]=**Plectrosternus** LACORDAIRE.
1906, Gen. Ins., fasc. 46, p. 304.
Type.—*Plectrosternus rufus* LACORDAIRE.

[**Plectrostenus** (Lacordaire) MARSHALL (typ. err.)]=**Plectrosternus** LACORDAIRE.
1873. Nomen. Zool., p. 233.
Type.—*Plectrosternus rufus* LACORDAIRE.

Plectrosternus LAROCDAIRE=(**Plectosternus** SCHWARZ and **Plectrosternus** MARSHALL, typ. err.).
1857, Gen. Col., vol. 4, p. 227.
Type.—*Plectrosternus rufus* LACORDAIRE. (Monobasic and by original designation.)
NOTE.—Suggested as new name for *Oxysternus*, but, as he fixes type, they are not isogenotypic.

Pleonomoides SCHWARZ.
1906, Gen. Ins., fasc. 46, p. 302.
Type.—*Nomopleus flavus* SCHWARZ, Deutsche Ent. Zeit., p. 292, 1903. (Monobasic.)

Pleonomus MENETRIES=(**Ictis** CANDÈZE, not KAUP, 1829)=(**Macrodes** DEJEAN, nomen nudum).
1849, Mem. Acad. Sci. St. Petersb., vol. 6, p. 48, pl. 2, fig. 6. Two species.
Type.—*Pleonomus tereticollis* MENETRIES. (Designation of Lacordaire, Gen. Col., vol. 4, p. 222, 1857.)

Pleurathous REITTER.
1905, Bestim. Tab., Heft 56, pp. 33, 48. Five species.
Type.—*Athous godarti* MULSANT, Opusc. Ent., vol. 6, p. 75, 1853. (Original designation.)

Podeonius KIESENWETTER.
1857–61, Naturg. Ins. Deut., vol. 4, pp. 229, 349.
Type.—*Elater acuticornis* GERMAR, Ins. Sp. Nov., p. 57, 1824. (Monobasic.)

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[1] Fossil.

Podonema SOLIER.
1851, Gay. Hist. fis. Chile, Zool., vol. 5, p. 19.
Type.—*Podonema impressum* SOLIER. (Monobasic.)

Pöemnites BUYSSON.
1906, Hayden Cat., p. 388.
Type.—*Diacanthus aeratus* MULSANT. Opusc. Ent., fasc. 7, p. 97, 1856. (Monobasic.)
NOTE.—Buysson reviewed the Elateridae in this catalogue and here erected this genus.

Pomachilioides CANDÈZE.
1896, Elat. Nouv., fasc. 6, p. 51.
Type.—*Pomachilioides ludiiformis* CANDÈZE. (Monobasic.)

Pomachilioides SCHWARZ, not CANDÈZE=**Paracosmesus** SCHWARZ.
1900, Deutsche Ent. Zeit., p. 344. Four species.
Type.—*Pomachilioides cruciatus* SCHWARZ. (Present designation.)

Pomachilius ESCHSCHOLTZ=(**Pomatochilus** GEMMINGER and HAROLD, emend.).
1829, Thon. Archiv., vol. 2, pt. 1, p. 31.
Type.—*Elater subfasciatus* GERMAR, Ins. Sp. Nov., p. 50, 1824. (Monobasic.)

[**Pomatochilus** (Eschscholtz) GEMMINGER and HAROLD, emend.]=**Pomachilius** ESCHSCHOLTZ.
1869, Cat. Col., vol. 5, p. 1541. Forty-one species.
Type.—*Elater subfasciatus* GERMAR. (Type of *Pomachilius*.)

Porthmidius GERMAR.
1847, Fauna Ins. Eur., fasc. 24, p. 7.
Type.—*Ampedus fulvus* REDTENBACHER, Dis. Gener. et. sp. Col. Aust., p. 11, 1842. (Monobasic.)

Priopus LAPORTE DE CASTELNAU.
1840, Hist. Nat. Anim. Art., vol. 1, p. 251. Five species.
Type.—*Priopus frontalis* LAPORTE DE CASTELNAU. (Present designation.)
NOTE.—This is the only new species included.

Pristilophus LATREILLE.
1834, Ann. Soc. Ent. France, vol. 3, 151. Two species.
Type.—*Elater melancholicus* FABRICIUS, Ent. Syst. Suppl., p. 139, 1798. (Designation of Erichson, Wieg. Archiv., vol. 2, p. 174, 1843.)

Probothrium CANDÈZE=(**Probotrium** CANDÈZE, emend.).
1863, Monogr. Elat., vol. 4, p. 287. Nine species.
Type.—*Probothrium pupillum* CANDÈZE. (Present designation.)

[**Probotrium** CANDÈZE emend.]=**Probothrium** CANDÈZE.
1891, Cat. Method. Elat., p. 188.
Type.—*Probothrium pupillum* CANDÈZE.

Procraerus REITTER.
1905, Bestim. Tab., Heft 56, p. 11. Four species.
Type.—*Megapenthes tibialis* LACORDAIRE, Fauna Ent. d. env. d. Paris, p. 658, 1835. (Present designation.)

Proloboderus FLEUTIAUX.
1912, Bull. Soc. Ent. France, p. 264.
Type.—*Proloboderus crassipes* FLEUTIAUX. (Monobasic.)

Propheletes FIORI.
1905, Riv. Col. Ital., vol. 3, p. 131.
Type.—*Limonius* (*Propheletes*) *grandii* FIORI. (Monobasic.)

Propsephus HYSLOP=(**Psephus** CANDÈZE, not KIRBY).
New name for **Psephus** CANDÈZE, preoccupied.
Type.—*Psephus beniniensis* CANDÈZE.

Prosternon LATREILLE.
1834, Ann. Soc. Ent. France, vol. 3, p. 151. Three species.
Type.—*Elater holosericeus* FABRICIUS, Ent. Syst., vol. 2, p. 222, 1775. (Designation of Westwood, Int. Mod. Class. Ins., vol. 2, Gen. Syn., p. 25, 1840.)

Protelater SHARP.
1877, Ann. Mag. Nat. Hist., ser. 4, vol. 19, No. 114, p. 482. Five species.
Type.—*Protelater elongatus* SHARP. (Present designation.)

Psellis CANDÈZE.
1860, Monogr. Elat., vol. 3, p. 289.
Type.—*Cratonychus promiscuus* ERICHSON, Germar's Zeit., vol. 3, p. 112, 1839. (Monobasic.)

[**Psephus** CANDÈZE, not KIRBY, 1826, Lamellicornia]=**Propsephus** HYSLOP.
1859, Monogr. Elat., vol. 2, p. 19. Sixteen species.
Type.—*Psephus beniniensis* CANDÈZE. (Present designation.)

Pseudaeolus CANDÈZE.
1891, Cat. Method., p. 77. Four species.
Type.—*Aeolus australis* CANDÈZE, Monogr. Elat., vol. 2, p. 284, 1859. (Present designation.)

Pseudagriotes SCHWARZ.
1896, Deutsche. Ent. Zeit., p. 103.
Type.—*Pseudagriotes holtzi* SCHWARZ. (Monobasic.)

Pseudiconus CANDÈZE.
1881, Elat. Nouv., fasc. 3, p. 76.
Type.—*Pseudiconus mendax* CANDÈZE. (Monobasic.)

[**Pseudocorymbites** FIORI]=**Harminius** FAIRMAIRE.
1899, Atti. Soc. Modena, ser. 3, vol. 16, no. 31, p. 162.
Type.—*Athous castaneus* FAIRMAIRE, Ann. Soc. Ent. France, 1852. (Monobasic.)
NOTE.—Isogenotypic with *Harminius* FAIRMAIRE.

Pseudoelateropsis[1] HANDLIRSCH=(Elateropsis ROEMER, not CHEVROLAT).
1906–1908, Die Fossilen Insect., vol. 1, p. 399. New name for *Elateropsis* ROEMER preoccupied.
Type.—*Elateropsis infraliassica* ROEMER.
NOTE.—Handlirsch (1906) "die (Flugeldecken) aber kein einziges für Elateriden charakteristisches Moment enthalten."

Pseudolacon BLACKBURN.
1889, Trans. Roy. Soc. S. Australia, vol. 13, p. 89.
Type.—*Pseudolacon rufus* BLACKBURN. (Monobasic.)

Pseudotetralobus SCHWARZ.
1902, Stettin. Ent. Zeit., p. 210.
Type.—*Pseudotetralobus dohrni* SCHWARZ. (Monobasic.)

Pseudothyrea[1] HANDLIRSCH.
1906–1908, Die Fossilen Insect., vol. 1, p. 541, pl. 45, fig. 2.
Type.—*Eurythyrea grandis* OPPENHEIM, Palaeontogr., vol. 34, pl. 31, fig. 8, 1888. (Monobasic.)

Psiloniscus CANDÈZE=(**Conoderus** CHEVROLAT, 1835, not ESCHSCHOLTZ, 1829).
1860, Monogr. Elat., vol. 3, p. 3. Four species.
Type.—*Psiloniscus sticticus* CANDÈZE. (Present designation.)

Psorochroa BROUN.
1883, New Zealand Journ. Sci., vol. 1, p. 301.
1885, Man. N. Zeal. Col., p. 773.
Type.—*Psorochroa granulata* BROUN. (Monobasic.)

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[1] Fossil.

Pyrapractus Fairmaire.
1884, Ann. Soc. Ent. France, ser. 6, vol. 4, p. 228.
Type.—*Pyrapractus sycophanta* Fairmaire. (Monobasic.)

Pyrischius Hyslop, new name=(Ischius Candèze, not Wesmael, 1837).
New name for *Ischius* Candèze, preoccupied.
Type.—*Ischius gerstaeckeri* Candèze. (Takes type of *Ischius*.)

Pyrophorus Illiger.
1809, Mag. Ges. Nat. Fr. Berlin, vol. 1, p. 141. Sixteen species.
Type.—*Elater noctilucus* Linnaeus, Syst. Nat., vol. 1, p. 657, 1758. (Present designation.)

[**Pytiobius** (LeConte) O. Schwarz, typ. err.]=**Pityobius** LeConte.
1906, Gen. Ins., fasc. 46, p. 192.
Type.—*Pityobius anguinus* LeConte.

[**Quarinus** (Gozis) Schwarz, typ. err.]=**Quasimus** Gozis.
1906, Gen. Ins., fasc. 46, p. 151.
Type.—*Cryptohypnus minutissimus* Germar.

Quasimus Gozis.
1886, Recher d. sp. typ. d. quel. ancien. gen., p. 22.
Type.—*Cryptohypnus minutissimus* Germar, Faun. Ins. Eur., pp. 6, 8, 1817. (Monobasic.)

[**Rhacocrepidius** Motschulsky=nomen nudum.]
1859, Bull. Soc. Imp. Nat. Moscou, vol. 32, No. 2, p. 359. In table, no species included.

[**Rhacotarsus** Motschulsky=nomen nudum.]
1859, Bull. Soc. Imp. Nat. Moscou, vol. 32, pt. 2, p. 359. In table, no species included.

Rhinopsephus Schwarz.
1906, Gen. Ins., fasc. 46, p. 82.
Type.—*Psephus milaris* Schwarz, Arkiv. f. Zool. Stockholm, vol. 1, p. 50, 1903. (Present designation.)

[**Scaphocrepidius** Motschulsky=nomen nudum.]
1859, Bull. Soc. Nat. Moscou, vol. 32, No. 2, p. 358. In table without species.

Scaphoderus Candèze.
1857, Monogr. Elat., vol. 1, p. 46.
Type.—*Scaphoderus riehlii* Candèze. (Monobasic.)

Scelisus Candèze.
1863, Monogr. Elat., vol. 4, p. 327.
Type.—*Scelisus sanguineus* Candèze. (Monobasic.)

[**Scoliocerus** Motschulsky, not Wollaston, 1854, Curculionidae]=**Hypnoidus** Stephens.
1859, Mem. Biol. Acad. St. Petersb., vol. 3, p. 227. Four species.
Type.—*Scoliocerus basalis* Motschulsky. (Present designation.)

Selatosomus Stephens.
1830, Man. Brit. Col., vol. 3, p. 268. Three species.
Type.—*Elater cruciatus* Linnaeus, Syst. Nat., vol. 2, p. 653, 1759. (By elimination.)

Note.—Of the other two species *E. aeneus* Linnaeus is the type of *Aphotistus; E. bimaculatus* Fabricius is the type of *Drasterius*.

Semiotopsis Candèze.
1882, Not. Leyd. Mus., vol. 4, p. 187.
Type.—*Semiotopsis ungulata* Candèze. (Monobasic.)

Semiotus Eschscholtz.
1829, Thon. Archiv., vol. 2, pt. 1, p. 31. Four species.
Type.—*Elater furcatus* Fabricius, Ent. Syst., vol. 2, p. 224, 1775. (Present designation.)

Senodonia LAPORTE DE CASTELNAU.
1836, Silbermann Rev. Ent. Col., vol. 4, p. 12.
Type.—*Semiotus* (*Senodonia*) *quadricollis* LAPORTE DE CASTELNAU. (Monobasic.)

Sephilus CANDÈZE.
1878, Ann. Mus. Stor. Nat. Genova, vol. 12, p. 108.
Type.—*Sephilus frontalis* CANDÈZE. (Monobasic.)

[**Sericomus** GEBLER, typ. err.]=(**Sericosomus** DEJEAN)=**Sericus** ESCHSCHOLTZ.
1847, Bull. Soc. Imp. Nat. Moscou, vol. 20, pt. 2.
Type.—*Elater brunneus* LINNAEUS. (Takes type of *Sericosomus*.)

[**Sericosomus** (Serville) DEJEAN]=**Sericus** ESCHSCHOLTZ.
1833, Dejean, Cat., ed. 3, p. 96. Four species, one of which is manuscript.
Type.—*Elater brunneus* LINNAEUS, Syst. Nat., vol. 2, p. 653, 1759. (Designation of Westwood in Int. Mod. Class. Ins., vol. 2, Gen. Syn., p. 25, 1840.)

NOTE.—Isogenotypic with *Sericus* ESCHSCHOLTZ. *E. brunneus* FABRICIUS was originally included.

Sericus ESCHSCHOLTZ=(**Sericosomus** DEJEAN).
1829, Thon. Arch., vol. 2, pt. 1, p. 34. Two species.
Type.—*Elater brunneus* LINNAEUS, Syst. Nat., vol. 2, p. 653, 1759. (Present designation.)

NOTE.—The other included species, *E. fugax* FABRICIUS, is synonymous with the above.

[**Serronychus** MOTSCHULSKY=nomen nudum.]
1859, Bull. Soc. Imp. Nat. Moscou, vol. 32, pt. 2, p. 359. In table without species.

[**Serropalpus** FALDERMANN, not HELLENIUS, 1786, Melandryidæ]=**Pleonomus** MENETRIES.
1835, Coleo. ab. Illustr. Bungio in China Bor., etc., p. 414.
Type.—*Serropalpus spinicollis* FALDERMANN. (Monobasic.)

Silene BROUN.
1893, Man. New Zealand Col., p. 1135.
Type.—*Silene brunnea* BROUN. (Monobasic.)

Silesis CANDÈZE=(**Cratonychus** REICHE, not DEJEAN and ERICHSON).
1863, Monogr. Elat., vol 4, p. 458. Seven species.
Type.—*Silesis hilaris* CANDÈZE. (Present designation.)

Silicernius[1] HEYDEN.
1859, Palaeontographica, vol. 8, p. 6, pl. 1, fig. 9.
Type.—*Silicernius spectabilis* HEYDEN. (Monobasic.)

Simodactylus CANDÈZE.
1859, Monogr. Elat., vol. 2, p. 169.
Type.—*Aeolus cinnamomeus* BOISDUVAL, Voy. Astrol., Col., p. 106, 1835. (Monobasic.)

Singhalenus CANDÈZE.
1859, Monogr. Elat., vol. 2, p. 43. Two species.
Type.—*Singhalenus taprobanicus* CANDÈZE. (Present designation.)

Sinuaria JORDAN.
1894, Novit. Zool., vol. 1, p. 487.
Type.—*Sinuaria aenescens* JORDAN. (Monobasic.)

Smiliceroides SCHWARZ.
1906, Gen. Ins., fasc. 46, p. 138.
Type.—*Psiloniscus quadrilineatus* SCHWARZ, Deutsche Ent. Zeit., p. 328, 1900. (Monobasic.)

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[1] Fossil.

Smilicerus Candèze.
1860, Monogr. Elat., vol. 3, p. 20. Two species.
Type.—*Smilicerus sallei* Candèze. (Present designation.)

[**Somanecus** (Solier) Candèze, typ. err.]=**Somomecus** Solier.
1863, Monogr., vol. 4, p. 513.
Type.—*Somomecus parallelus* Solier.

[**Somomecus** Solier=**Somanecus** (Solier) Candèze, typ. err.]
1851, Gay. Hist. fis. Chile, Zool., vol. 5, p. 33.
Type.—*Somomecus parallelus* Solier. (Monobasic.)

Sossor Candèze.
1883, Not. Leyden Mus., vol. 5, p. 208.
Type.—*Sossor hageni* Candèze. (Monobasic.)

Sphaenelater Schwarz.
1902, Deutsche Ent. Zeit., p. 365.
Type.—*Sphaenelater nigricornis* Schwarz. (Monobasic.)

Note.—Schwarz, 1906, reduces his genus to synonymy under *Geranus* Sharp, and the type to synonymy under *Geranus lineicollis* White.

Spheniscosomus Schwarz.
1892, Wien. Ent. Zeit., p. 132. Six species.
Type.—*Melanotus cuneiformis* Baudi, Berl. Ent. Zeit., p. 53, 1871. (Present designation.)

Sphenomerus Candèze.
1859, Monogr. Elat., vol. 2, p. 41. Three species.
Type.—*Sphenomerus antennalis* Candèze. (Present designation.)

Spilomorphus Champion.
1894, Biol. Centr. Amer., Col., vol. 3, p. 296.
Type.—*Spilomorphus rubricollis* Champion. (Monobasic.)

Spilus Candèze.
1859, Monogr. Elat., vol. 2, p. 87. Four species.
Type.—*Spilus rubidus* Candèze. (Present designation.)

[**Steatoderus** Eschscholtz]=**Elater** Linneaus.
1833, Dejean, Cat., ed. 3, p. 94. Four species, three of which are manuscript.
Type.—*Elater ferrugineus* Fabricius, Syst. Eleuth., vol. 2, p. 225, 1801. (Monobasic.)

Note.—Isogenotypic with *Elater* Linnaeus.

Stenagostus Thomson.
1859, Skand. Col., vol. 1, p. 104.
Type.—*Elater rufus* Fabricius, Syst. Eleuth., vol. 2, p. 225, 1801. (Original designation.)

Note.—*Athous rufus* De Geer type designation of Reitter, Bestlm. Tab. 56, p. 34, 1905. This species is usually considered to be synonymous with the Fabrician species.

Stenelytron[1] Handlirsch.
1906–1908, Die Fossilen Insect., vol. 1, p. 451, pl. 41, fig. 56.
Type.—*Elater redtenbacheri* Giebel, Ins. Vorw., p. 92, 1856. (Monobasic.)

Note.—" Gehört vielleicht wirklich zu den Elateriden."

Stenocrepidius Schwarz=(**Stenopus** Schwarz, not Guilding).
1902, Deut. Ent. Zeit., p. 126. New name for *Stenopus* Schwarz, preoccupied.
Type.—*Stenopus angustus* Schwarz.

[**Stenopus** Schwarz, not Guilding, 1827, Mollusca, not Latreille, 1829, Crustacea]=**Stenocrepidius** Schwarz.
1900, Deutsche Ent. Zeit., p. 307. Six species.
Type.—*Stenopus angustus* Schwarz. (Present designation.)

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[1] Fossil.

Stibadoderus BURMEISTER.
1875, Stettiner Ent. Zeit., p. 271.
Type.—*Stibadoderus murinus* BURMEISTER. (Monobasic.)

Stichotomus CANDÈZE.
1863, Monogr. Elat., vol. 4, p. 507.
Type.—*Cylindroderus corrigiolatus* GERMAR, Linn. Entom., vol. 3, p. 181, 1848. (Monobasic.)

[**Stilpnus** LAPORTE DE CASTELNAU, not GRAVENHORST, 1829 Hymenoptera]=**Pyrophorus** ILLIGER.
1840, Hist. Nat. Anim. Art., vol. 1, p. 236. Two species.
Type.—*Pyrophorus havaniensis* LAPORTE DE CASTELNAU, His. Nat. Ins., vol. 1, p. 236, 1840. (Present designation.)
NOTE.—*P. acutipennis* LAPORTE, the other species originally included, is now recognized as a synonym of *P. pyrophanus* ILLIGER.

Symphostethus SCHWARZ.
1903, Deutsche Ent. Zeit., p. 382.
Type.—*Symphostethus collaris* SCHWARZ. (Monobasic.)

Synaptus ESCHSCHOLTZ.
1829, Thon. Archiv., vol. 2, pt. 1, p. 32. Two species.
Type.—*Elater filiformis* FABRICIUS, Sp. Ins., vol. 1, p. 270, 1781. (Present designation.)

Tabula FLEUTIAUX.
1899, Bull. Mus. Hist. Nat. Paris, p. 367.
Type.—*Tabula depressissima* FLEUTIAUX. (Monobasic.)

Tactocomus KIESENWETTER.
1863, Natur. Ins. Deutschl., vol. 4, p. 301.
Type.—*Elater holosericeus* FABRICIUS, Ent. Syst., vol. 2, p. 222, 1801. (Monobasic.)

Tarsalgus CANDÈZE.
1881, Elat. Nouv., fasc. 3, p. 39.
Type.—*Tarsalgus mechowi* CANDÈZE. (Monobasic.)
NOTE.—Candèze (1891) reduces the type to synonymy under *Tarsalgus* (*Dicronychus*) *tibialis* HAROLD (Münch. Ent. Ver., p. 106, 1878).

Telesus CANDÈZE.
1880, Not. Leyden Mus., vol. 2, p. 9.
Type.—*Telesus ritsemae* CANDÈZE. (Monobasic.)

[**Terimecus** (Stephens) O. SCHWARZ, typ. err.]=**Perimecus** STEPHENS.
1906, Gen. Ins., fasc. 46, p. 186.
Type.—*Elater fulvipes* HERBST.

Teslasena FLEUTIAUX.
1892, Ann. Soc. Ent. France, p. 410.
Type.—*Anelastes femoralis* LUCAS, Voy. de Castelnau, p. 71, 1857. (Monobasic.)

Tetralobus LEPELLETIER and SERVILLE.
1825, Enc. Meth., vol. 10, p. 594.
Type.—*Elater flabellicornis* LINNAEUS, Syst. Nat., vol. 1, pt. 2, p. 651, 1758. (Designation of Lacordaire, Gen. Col., vol. 4, p. 164, 1857.)

Tetrigus CANDÈZE.
1857, Monogr. Elat., vol. 1, p. 254. Two species.
Type.—*Tetrigus parallelus* CANDÈZE. (Present designation.)

Tharopsides FLEUTIAUX.
1918, Bull. Mus. National d'Hist. Nat., No. 4, p. 235.
Type.—*Tharopsides harmandi* FLEUTIAUX. (Monobasic.)

Thaumastiellus SCHWARZ.
1902, Deutsche Ent. Zeit., p. 335.
Type.—*Thaumastiellus bioculatus* SCHWARZ. (Monobasic.)

Thoramus SHARP.
1877, Ann. Mag. Nat. Hist., p. 399. Four species.
Type.—*Thoramus wakefieldi* SHARP. (Present designation.)

Tibionema SOLIER.
1851, Gay. Hist. fis. Chile, Zool., vol. 5, p. 30.
Type.—*Tibionema rufiventris* SOLIER. (Monobasic.)

[**Tilotarsus** (Germar) CANDÈZE emend.]=**Tylotarsus** GERMAR.
1891, Cat. Method., p. 27.
Type.—*Tylotarsus cinctipes* GERMAR.

Tomicephalus LATREILLE.
1834, Ann. Soc. Ent. France, vol. 3, p. 146.
Type.—*Tomicephalus sanguinicollis* LATREILLE. (Monobasic.)

[**Tomocephalus** (Latreille) GEMMINGER and HAROLD, emend.]=**Tomicephalus** LATREILLE.
1869, Cat., vol. 5, p. 1587.
Type.—*Tomicephalus sanguinicollis* LATREILLE.

Toxognathus FAIRMAIRE.
1878, Ann. Soc. Ent. France, ser. 5, vol. 8, p. 271.
Type.—*Toxognathus costulatus* FAIRMAIRE. (Monobasic.)

Trachylacon MOTSCHULSKY.
1858, Etud. Ent., vol. 7, pt. 1, p. 61. Two species.
Type.—*Trachylacon fulvicollis* MOTSCHULSKY. (Present designation.)

[**Trichophorus** MULSANT and GODART, not SERVILLE, 1834, Cerambycidae, not TEMMINCK, 1838, Aves]=**Neotrichophorus** JACOB.
1838, Opusc. Ent., vol. 2, p. 181.
Type.—*Trichophorus guillebelli* MULSANT. (Monobasic.)

Tricrepidius MOTSCHULSKY.
1859, Bull. Soc. Imp. Nat. Moscou, vol. 32, pt. 2, p. 366.
Type.—*Tricrepidius triangulicollis* MOTSCHULSKY. (Monobasic.)

Triëlasmus BLANCHARD.
1843, D'Orbigny Voy. Amer. merid., vol. 6, pt. 2, Ins. p. 131.
Type.—*Triëlasmus varians* BLANCHARD. (Monobasic.)

Trieres CANDÈZE.
1900, Elat. Nouv., fasc. 7, p. 78.
Type.—*Trieres ramitarsus* CANDÈZE. (Monobasic.)

Triplonychoides SCHWARZ.
1906, Gen. Ins., fasc. 46, p. 181. Two species.
Type.—*Triplonychus trivittatus* CHAMPION, Biol. Centr. Amer., Col., 3, p. 427, 1895. (Present designation.)

Triplonychus CANDÈZE.
1860, Monogr. Elat., vol. 3, p. 236. Ten species.
Type.—*Triplonychus acuminatus* CANDÈZE. (Present designation.)

Tropidiplus FLEUTIAUX.
1903, Bull. Soc. Ent. France, p. 251.
Type.—*Tropidiplus tellinii* FLEUTIAUX. (Monobasic.)

Tropihypnus REITTER.
1905, Bestim. Tab., Heft 56, p. 9.
Type.—*Paracardiophorus bimargo* REITTER, Wien. Ent. Zeit., vol. 15, p. 235, 1896. (Monobasic.)

Tylotarsus Germar.
1840, Zeit. f. Ent., vol. 2, p. 247.
Type.—*Tylotarsus cinctipes* Germar. (Monobasic.)

[**Ypsiloshettus** (Candèze) Marschall, emend.]=**Ypsilosthetus** Candèze.
1873, Nom. Zool., p. 254.
Type.—*Ypsilosthetus semiotulus* Candèze.

Ypsilosthetus Candèze.
1859, Monogr. Elat., vol. 2, p. 521.
Type.—*Ypsilosthetus semiotulus* Candèze (Monobasic).

Zeaglophus Broun.
1895, Ann. Nat. Hist., vol. 15, p. 234.
Type.—*Zeaglophus pilicornis* Broun (Monobasic).

Zorochrus Thomson.
1859, Skand. Col., vol. 1, p. 106.
Type.—*Elater dermestoides* Herbst, Käfer, vol. 10, p. 85, 1806. (Monobasic.)

A few of the generic names used in this family have been found to be preoccupied and in certain cases it has been necessary to suggest new names.

The following is a list of the new generic names proposed in the preceding pages:

Brounaeolus,
Elatichrosis,
Elatocoelus,
Eleuphemus,
Monetriesia,
Neodiploconus,
Propsephus,
Pyrischius.

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[In this specific index, where the name is followed by two generic names, the first (given in parenthesis is the genus in which the species was described, and the second is the genus of which it is the type; where only one generic name is given, the species was described in and is the type of that genus.]

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